Cruise Report

R/V ENDEAVOR Cruise 298 to Georges Bank

7 - 19 April 1997

Acknowledgments

We gratefully acknowledge the friendly and expert support of the officers, crew and marine technician on board R.V. Endeavor. Their professionalism and cooperation enabled us to complete a very satisfying program despite some unfavorable weather. Special thanks to Jack Buss and his deck crew for helping us set the MOC-10 record!

This cruise was sponsored by grants from the National Science Foundation. This report was prepared by Larry Madin, Erich Horgan and Mari Butler with contributions from the scientific party.

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Purpose of the Cruise.

This was the second Process Cruise of the 1997 field year. Process studies in 1995 focussed on the physics of water column stratification on the south flank of Georges Bank, and the response of the biological community. In 1997 the emphasis is on sources of water and organisms onto the Bank, their retention there, or loss from the Bank. In addition to 6 Broad Scale cruises to map the seasonal distribution of organisms over the Bank, there are 10 process-oriented cruises to study fine-scale distribution, vital rates and species interactions. Four principal projects shared this cruise; their main objectives were:

A. To sample larger zooplankton in places that might constitute sources of predators coming onto Georges Bank, and to continue shipboard experiments on feeding and digestion (WHOI Predation Group; Madin et al.).

B. To estimate feeding rates of chaetognaths and ctenophores based on in-situ gut contents and measruement of digestion (Klein-MacPhee)

C. To collect *Calanus* nauplii and supporting data on chlorophyll and phytoplankton composition for shipboard grazing incubations (Gifford et al.).

D. To determine the distribution of smaller zooplankton in and around transient hydrographic features, with simultaneous fine-scale measurements of pigment absorption and fluorescence (Wishner et al.).

The cruise track and station locations were chosen by the PIs to include stations off the Bank in regions that might be sources of organisms moving on to the Bank. These included Georges Basin, the Northeast Channel, Great South Channel and the Slope water south of the Bank. Stations were also chosen on the Bank, in a mixed region of the Northeast Peak, the central Bank crest, and the south flank. We were particularly interested in a plume of cold Scotian Shelf water that crossed over the NE peak, as shown in the satellite images (see Appendix). Since this feature was a clear instance of advection onto the Bank, we focussed efforts at two stations on this plume.

The work plan at each station included morning CTD casts, two MOC-1 and two MOC-10 tows during both day and night, SCUBA diving collections and other tows with vertical plankton nets. Limitations of time and weather prevented us from accomplishing all the replicate tows at all stations, but day/night samples were obtained at every station except 1 and 6.

Table 1. Station locations and dates for Endeavor 298

No.	Station Name	Position	Begin	End	Characteristic
1	Georges Basin	42° 25'N 66° 48'W	4/8/97 1930 h	4/9/97 2100 h	Off-bank source region
2	NE peak-mixed	41° 52'N 66° 30'W	4/10/97 0600 h	4/11/97 2330 h	On-bank comparison
3a	Cold plume	42° 00'N 66° 16'W	4/12/97 0200 h	4/13/97 0700 h	Plume from Scotian Shelf
3b	Cold plume again	42° 02'N 66° 06'W	4/13/97 1000 h	4/13/97 2000 h	Relocated plume
4	NE Channel	42° 20'N 66° 00'W	4/14/97 0700 h	4/15/97 0000 h	Off-Bank source region
5	Great South Channel	41° 40'N 68° 30'W	4/15/97 1230 h	4/16/97 1200 h	Off-Bank source region
6	Bank crest	41° 12'N 67° 58'W	4/16/97 1530 h	4/16/97 1900 h	On Bank comparison
7	South flank	40° 45'N 68° 00'W	4/16/97 2130 h	4/17/97 1600 h	On Bank comparison
8	Slope	40° 15'N 68° 15'W	4/17/97 1900 h	4/18/97 0800 h	Off-Bank source region

Cruise Narrative

Endeavor was scheduled to depart Narragansett at 1100 on April 7, 1997. Unfortunately the ADCP unit on board had failed the previous week, and efforts to secure a replacement over the weekend were unsuccessful. ADCP data was considered critical for Wishner and Donaghay's sampling program. Sailing was delayed while more calls were made, and finally a unit was located on Knorr, due in to Woods Hole that afternoon. We sent a scientist back to WHOI to pick up the unit and return it to Narragansett. Once the ADCP was installed and working Endeavor departed at 1948.

Station 1, in Georges Basin, was reached at 1730 on April 8. After an initial CTD, we deployed the MOC-10 for the first time. On recovery, we found all 5 cod-ends were missing, including 3 of the collars, but without significant damage to the nets. We are still not sure what caused this. Successful day tows with both MOCs were made on 4/9 at this station, but deteriorating weather in the evening prevented making night collections. Instead we departed for

Station 2, a well-mixed site on the NE peak.

Weather on 4/10 at Station 2 prevented any sampling work until evening, when 1 MOC-1 tow was made. The next morning conditions had improved, permitting day and night tows and 1 SCUBA dive. We departed Station 2 at 0000 h, steaming eastwards to look for the cold water plume coming off the Scotian Shelf. This was located at about 0200, and Station 3a was begun with a MOC-1 and CTDs. Weather was excellent on 4/12 with overcast and flat seas, permitting replicate tows with both systems. A SCUBA dive to the interface of the cold plume with underlying Bank water revealed that the plume was filled with diatoms and small copepods, having a yellowish tinge and 10 ft visibility. Beginning at about 20 m, the Bank water was much clearer, with little marine snow and sparse animals. By 4/13 the weather had worsened some and we found we were no longer in the cold plume. It was relocated at about 1000 and we began Station 3b with MOC-1 and MOC-10 tows in the afternoon. By nightfall conditions were too rough for towing, so we headed to Station 4.

Conditions were slightly improved at Station 4 in the Northeast Channel, and we completed day and night MOC-1 and MOC-10 hauls on 4/14, before departing at midnight for Station 5 in Great South Channel. It had been decided to change the order of remaining stations, going to GSC first in order to insure enough on-Bank sampling before the weather worsened. Station 5 was reached at 1230 on 4/15; weather was excellent. We made several day and night tows at this station without incident, and one additional SCUBA dive, which found almost no large zooplankton.

Reports of an approaching gale caused us to make Station 6 on the Bank crest very short, with one MOC-1 and MOC-10 tow. *Phaeocystis* was extremely dense at this station, as were populations of small mysids. After 3.5 h we proceeded to Station 7 on the South Flank, arriving at 2130 on 4/16 and beginning the station with a CTD, then pairs of night MOC-1 and MOC-10 hauls. Daytime tows at Station 7 were completed on 4/17, and we remained on station, in the cold water, long enough for Gifford to conclude her feeding incubations.

Severe weather was now expected for 4/18-20, and it was decided that we would have to go in to port a day early. We arrived at Station 8 on the slope at 1900 h on 4/17 and made night tows with the MOC-1 and MOC-10. A last day MOC-10 tow was made at 0600 the following morning. Science concluded at 0800 and Endeavor began making for port. We arrived at Narragansett at 0630 on 4/19.

Individual Research Reports

Sources and Distribution of Invertebrate Predators of Target Species

Larry Madin, Erich Horgan, Mari Butler, Brian Blease, Tom Butler

The goals of this cruise for the WHOI predation group were to (1) sample distributions of invertebrate predators in areas which might be sources of predators for Georges Bank, and (2) to continue with laboratory experiments on gut clearance times for some of the main predator species. Related work on predation by *Pleurobrachia* is described below in the report from Grace Klein-MacPhee.

MOCNESS Sampling.

We made a total of 24 collections with the 10 m^2 MOCNESS trawl. On the very first tow, all 5 cod ends were inexplicably lost. There was little damage to the nets, and we have no ready explanation for this event, except the possibility that the trawl got fouled on derelict lines or fishing gear that wrapped around the nets and stripped off the cod end buckets. All subsequent tows were uneventful. Two additional collections were made with a 2 m diameter Reeve net, but use of the net was discontinued after sea conditions bent the net ring and kinked the wire.

Three SCUBA dives were made, at Station 2 in a mixed region of the Northeast Peak, Station 3 in the cold plume of Scotian Shelf water, and Station 5 in Great South Channel. Divers collected *Pleurobrachia* (mainly on the first dive) for digestion-rate experiments by Klein-MacPhee, and a few other ctenophores. No animals except copepods were seen or collected on the third dive.

Locations, times and depths of the MOC-10 collections are summarized below, with the major taxa present at each station. Preliminary assessments of MOC-10 catches were made as they came in. These results are summarized in Appendix X, but are subject to change when the samples are fully counted in the lab. Smaller predators species collected with the 1 m^2 MOCNESS fished by Wishner will also be counted, by Barbara Sullivan et al. at URI/GSO.

Table 2. Summary of MOC-10 trawls on EN 298

Sta.	Depth	#Day	#Night	Main taxa found
1	300	2	0	Themisto, euphausiids, *Euchaeta*
2	60	2	2	*Pleurobrachia*, *Themisto*, *Ammodytes*, euphausiids, gammarids
3a,b	70	3	2	*Pleurobrachia*, *Themisto*, *Ammodytes*, euphausiids,
4	230	1	1	*Pleurobrachia*, *Themisto*, euphausiids, *Aglantha*
5	160	2	2	euphausiids, *Euchaeta*, *Clione*, *Pandalus*, *Themisto*
6	45	1	0	*Pleurobrachia*, mysids, *Cirolana*
7	65	1	2	mysids, *Crangon*, gammarids, *Dichelopandalus*
8	275	1	1	euphausiids, sergestids, myctophids, *Pleurobrachia*

Gut Passage Time Experiments

We attempted to measure the gut passage time of *Themisto gaudichaudii*, an amphipod that dominated the plankton in many of our 10 meter MOCNESS hauls. Work by Schaeder (1975) suggests that at the water temperatures of approximately 4(C T. gaudichaudii should pass prey through their guts in about 72 hours. Our preliminary work suggests that this may be a gross overestimate of their gut passage times. In addition, *Calanus* sp. which Schaeder suggests is a common prey item did not seem to interest our experimental *Themisto* as much as fish larvae did.

For the first several days in captivity, the *Themisto* did not show any feeding activity. They were kept in an incubator (7(C) in several different containers (500-ml Erlenmeyer flasks, 250-ml culture flasks, 1-l jars sealed with parafilm) each containing one *Themisto* 5-6 *Calanus* sp. Feeding did not noticeably occur until the animals were put in the 1-l jars and covered with parafilm. But even then, only two *Themisto* consumed any *Calanus* sp. at all over the course of several days. These two individuals, however, produced feces more rapidly than suggested by Schaeder (1975) (Table ??).

Observations were made of *Themisto* consuming *Ammodytes* sp. readily in codend buckets. Therefore, we tried offering the experimental animals *Ammodytes* sp. stained with carmine. After a 48 hour period of starvation, the amphipods immediately began feeding on the *Ammodytes* sp., and we were able to estimate gut passage times from this feeding (Table 3). In addition, we offered another group of *Themisto* cod larvae that was caught in one of the MOC-10 hauls. These too were readily consumed, and gut passage times were estimated. In these two experiments 1-liter jars were used and they were kept at ambient sea water temperatures on a plankton wheel incubated with running sea water. In addition these jars were wrapped in mesh which reduced light levels to a level likely to be found in the water column where about 20% sunlight would reach. Once again, the gut passage times measured were substantially lower than those predicted by Schaeder's (1975) regression.

We also observed a 3-l beaker in which 10 *Themisto*, one *Pleurobrachia pileus* and several copepods were contained over several days. After 48 hours, all that remained in the beaker were a few *Calanus* sp. and six live *Themisto* which were devouring dead *Themisto*. No trace of the *Pleurobrachia* remained and several of the amphipods were either gone or nearly gone. This observation suggests that *Themisto* kept individually in containers might display different feeding behaviors than when they are in groups, and could practice the swarming behavior that is described by Gray and McHardy (1967).

Gray, J. S. and R. A. McHardy. 1967. Swarming of Hyperiid Amphipods. Nature. 215:100.

Sheader, M. and F. Evans. 1975. Feeding and gut structure of Parathemisto gaudichaudi (Guerin) (Amphipoda:hyperiidea). J. mar. biol. Ass. U.K. 55:641-656.

Table 3. Summary of gut-passage time (GPT) measurements for *Themisto gaudichaudii*

Start Date	Food	Temperature, °C.	Starvation Time, h.	Gut Passage Time, h.
4/10/97	*Calanus*	7 (incubator	0	6.7
4/10/97	*Calanus*	7 (incubator)	0	18.2
4/12/97	*Ammodytes*	2.6 (wheel)	48	3.6
4/12/97	*Ammodytes*	2.6 (wheel)	48	6.6
4/12/97	*Ammodytes*	2.6 (wheel)	48	15.9
4/16/97	*Gadus*	5.4 (wheel)	45	4.4
4/16/97	*Gadus*	5.4 (wheel)	45	10.0
4/16/97	*Gadus*	5.4 (wheel)	45	17.6
4/16/97	*Gadus*	5.4 (wheel)	45	36.4
4/16/97	*Gadus*	5.4 (wheel)	45	36.4

Predation studies with chaetognaths and ctenophores.

Grace Klein-MacPhee

The objectives which I had for this cruise were:

1. To collect chaetognaths in short tows and preserve immediately to be used for gut content analysis. These tows are to be paired with a Moc 1 tow for comparisons between gut contents collected in short tows which should minimize net feeding with those collected in conventional Moc-1 tows. Gut content analysis will be done in the laboratory at Narragansett.

2. Preserve diver collected *Pleurobrachia pileus* for gut content analysis. These will be compared with *Pleurobrachia* which were collected in Moc 1 tows.

3. To examine *Pleurobrachia* gut evacuation rates of diver collected animals so that these can be compared with digestion times.

4. To assist with the Moc 1 and Moc 10 collections.

Chaetognaths were scarce at most stations and absent at some. I made 8 vertical tows, at least one at each station. Chaetognaths were only abundant in one of the tows, present in small

amounts in three of the tows and absent in 4.

Pleurobrachia were collected by divers in the first dive on 4/9/97. I measured gut evacuation rates on 5 animals. Average gut evacuation rate was 7 hours. *Pleurobrachia* collected on this dive were starved for 48 hours and fed 5 *Calanus* each. The average digestion time was also 7 hours. The animals were producing eggs at the time.

Eight diver collected *Pleurobrachia* were preserved for gut content analysis which will be done back at the laboratory. Three dives were made and *Pleurobrachia* were only abundant in the first dive.

I assisted with Moc 1 and 10 collections throughout the cruise.

Zooplankton Recruitment Variability and Advective Processes on Georges Bank: Diet of Early Stage Copepods

Dian Gifford, Jeff Merrell and Terry Cucci

Our objectives on EN298 were four-fold: (1) To determine the distribution, abundance and biomass of nano- and microzooplankton in the water column; (2) to measure feeding rates of *Calanus finmarchicus* nauplii on phytoplankton and nano- and micro-heterotrophs in source versus on-Bank areas; (3) to collect females *Calanus finmarchicus* to provide brood stock for nauplii to be used in experiments on the next GLOBEC vital rates process cruise, EN301; and (4) to provide basic hydrographic data as service to the program.

Hydrographic data were collected using the URI Seabird Model 11 CTD/rosette package equipped with 10-L teflon-lined go-flo bottles. Water column samples were collected at seven of the eight stations occupied during the cruise: Georges Basin, Northeast Peak outside of the Scotian Shelf cold plume; Northeast Peak within the Scotian Shelf cold plume; Northeast Channel; Great South Channel; bank crest; and Southern Flank. Samples were collected for analysis of chlorophyll a, nanoplankton, and microplankton. Chlorophyll a was analyzed on board by fluorometry.

Nano-phytoplankton and -zooplankton samples were prepared for later analysis by enhanced image video epifluorescence microscopy. Micro- phytoplankton and zooplankton samples were preserved with acid Lugols solution for later analysis by inverted microscopy. Cell counts and biovolumes of cyanobacteria and 1-20 um autotrophic eukaryotes were analyzed on board using a FACSCAN flow cytometer.

Preliminary anaylsis indicates the following:

Station 1. The water column in Georges Basin was strongly stratified, with a well mixed surface layer to a depth of ~75 m. Chlorophyll levels were low, < 1 ug/L at all depths.

Station 2. On the Northeast Peak outside of the cold plume the water column was well mixed,

with ~2.5 ug/L chlorophyll at all depths.

Station 3. Waters on the Northeast Peak within the cold plume contained ~3 ug/L chlorophyll. The cold plume extended from the surface to approximately 20 m depth. Water below the plume contained < 1 ug/L chlorophyll. Phytoplankton within the plume was dominated by large chain-forming diatoms, primarily the genus *Chaetoceros*, which were not present at other on-Bank stations. Vertical tows with a 150 um mesh net indicated that the plume contained abundant calanoid copepod nauplii and marine invertebrate eggs. The latter were tentatively identified as *Pleurobrachia* by Grace Klein-MacPhee.

Station 4. In the Northeast Channel. chlorophyll was > 2.5 ug/L in the cold plume water and < 1 ug/L below the plume. Again, the cold plume contained abundant chain-forming diatoms and calanoid copepod nauplii.

Station 5. The water column in the Great South Channel was weakly stratified, with ~1.5 ug/L of chlorophyll in the mixed layer and <1 ug/L below the mixed layer. A bloom of large (visible to the naked eye) *Coscinodiscus* cells characterized the surface layer.

Station 6. The intended location of this station was the bank crest, but its depth (50 m) was more characteristic of a southern flank station. Chlorophyll levels were high (3-9 ug/L) throughout the water column. *Phaeocystis pouchettii* dominated the phytoplankton.

Station 7. On the Southern Flank, chlorophyll was < 1ug/L at all depths.

Zooplankton distributions near hydrographic features

Karen Wishner, Mike Twardowski, Margaret Dekshenieks, and Dawn Outram

Our focus on this cruise was to measure inputs and losses of zooplankton associated with episodic features and different water masses on and near Georges Bank. We interfaced a MOCNESS 1 m2 net system (153 micron mesh) with 2 bio-optical instruments, a WET Labs SaFire and ac-9, using a WET Labs MODAPS as a central data acquisition and archiving system. The SaFire measures 2-D spectral DOM fluorescence at a subset of wavelengths within the total 96 excitation/emission pairs, and the ac-9 measures spectral total absorption and attenuation, or DOM absorption when a prefilter is attached to the intake. The combination of these optical signatures should allow us to identify water types with a high degree of differentiation and to track subtle features over time. We intend to determine how closely zooplankton are associated with particular water masses (described hydrographically and bio-optically) by sampling with the MOCNESS / SaFire / ac-9 system day and night at source locations just off Georges Bank, on the Bank itself, and within episodic features of opportunity.

A total of 21 1-m2 MOCNESS tows were taken (Table 1). Tows were usually done during the same day or night as the 10 m2 MOCNESS tows (Madin group), and tow depths were

coordinated between the two groups. Eight vertically-stratified samples were usually obtained from each 1 m2 MOCNESS tow. Depth strata varied with the station depth; broader intervals were usually used for deep samples and 10 m depth intervals were used near the surface. Some day and night tows used standard depth strata; others used depth strata determined on the basis of the bio-optical and hydrographic signatures. Satellite imagery and underway measurements of sea surface temperature and salinity were used to locate the cold plume. ADCP data will be used to help interpret flow, especially in the cold plume. The ADCP deck box was borrowed at the last minute from the Knorr (courtesy of Jim Irish) by special courier on the day of departure (Monday), since the Endeavor's unit failed late Friday before the cruise.

Table 1 Summary of 1 m^2 MOCNESS tows

Station	# day tows	# night tows
1 Georges Basin	1	2
2 Northeast Peak	1	1
3 Cold Plume	3	2
4 Northeast Channel 1		1
5 Great South Channel	2	1
6 Crest	1	
7 Southern Flank	2	2
8 Slope	1	

Zooplankton Results

The following notes are based on visual observations of whole samples fresh from the nets and will obviously be modified by direct counts later in the lab. At many of the stations, the spring bloom was still in progress, and the zooplankton nets and samples were clogged by abundant large phytoplankton, especially *Phaeocystis* and large diatoms.

Georges Basin (bottom depth about 360 m) was stratified with cold fresh surface water, warmer more saline intermediate water, and cooler bottom water. *Calanus* was abundant in the surface water (along with euphausiids at night), the midwater was marked by a layer of *Phaeocystis* centered around 100 - 75 m, and the bottom water had a mixture of copepods, shrimp, and pteropods. The northeast peak (bottom depth about 80 m) was well mixed to the bottom. *Phaeocystis*, chaetognaths, and the ctenophore *Pleurobrachia* were common in all samples.

The cold plume was located by steaming northeast from station 2 towards a likely location based on satellite imagery obtained daily by e-mail on the ship. Sea surface temperature and salinity were monitored while underway, and we stopped at a location where the water temperture was 3.1 íC and salinity 31.75 ‰. The water was relatively warm for the cold plume, probably because of solar heating from the sunny days just prior to our sampling there. Over the course of

the next couple of days of sampling, we had to occasionally search again for this cold low salinity water before deploying gear, since the ship drifted in and out of it. The cold plume was about 15 m thick (but varied with exact location); water depth was about 83 m. Large *Chaetoceros* (diatoms) clogged the nets within the cold plume. Beneath the cold plume, *Pleurobrachia*, copepods, and amphipods were common. We continued farther north into the northeast channel (water depth 249 m) to further explore this source region. *Calanus*, amphipods, euphausiids, and chaetognaths were common at depth; surface nets had copepods, *Pleurobrachia*, and were still clogged with phytoplankton.

The Great South Channel station (bottom depth about 170 m) was mixed to about 75 m, sometimes with a thin surface layer. Zooplankton samples included copepods, euphausiids, and pteropods at depth and raspberry-colored *Calanus* in the upper 50 m. *Coscinodiscus* diatoms and *Phaeocystis* clogged all the nets in the night tow and the nets from 50 - 100 m during one of the two day tows. The shallow well-mixed crest station (bottom depth 50 m) had net clogging from *Phaeocystis*, with some amphipods and chaetognaths present. At the southern flank (water depth 80 m), the water was mostly well-mixed with a bit of a surface layer. Greenish gelatinous material was abundant at depth; copepods and small amphipods were abundant in the upper 20 m. The slope station (365 m water depth) was characterized by warm water at depth. Copepods, chaetognaths, and euphausiids occurred at depth; shrimp, copepods, and amphipods were common above 125 m.

Optics Results

At station 1 (4/9), DOM spectral fluorescence and DOM spectral absorption were measured. In the surface 20 m, the measurement of DOM absorption was obscured by cavitation in the flow cells, but as we descended the flow cells pressurized and clear values were obtained. The spectral peak in DOM fluorescence was at an EX:EM pair of 265:490 throughout the water column. DOM fluorescence was relatively high (average of 22 counts) in the surface mixed layer (90 m deep). At the bottom of the mixed layer, DOM fluorescence increased slightly to an average of 24-25 counts, peaking at about 105 meters. Between 105 and 140 meters there was a sharp decrease of about 30% in DOM fluorescence, and from 140 m to the bottom, the fluorescence was relatively constant. DOM absorption followed a similar pattern with depth.

Unlike our measurements from this past March at this station, the structure of the optics did not closely mimic the hydrography. This was an important and exciting observation because the unique optical signatures gave us additional means for parameterizing water types when determining when to trip nets. The non-conservative behavior of DOM fluorescence and absorption implied that biological, chemical, and photic processes in the water column were potentially changing DOM optical signatures, providing new tracers for tracking macrofaunal distributions. The small peak at the base of the mixed layer was especially interesting because subtle spectral fluorescence shifts were observed in the raw, real-time data, indicating that the

composition of the DOM pool may have been unique within this layer.

Station 2 (4/10-11), on the east side of Georges Bank, was well-mixed hydrographically and optically. At excitation 265 nm, emission 490 nm (EX265:EM490), the fluorescence was relatively high, averaging about 23 counts. The 0.2 micron filter was removed from the intake of the ac-9 for this station because we felt the total depth was not sufficient to pressurize the flow cells to obtain a clear DOM absorption cast. As a result, total absorption and attenuation coefficients were measured.

Station 3 (4/12-13) was characterized by the Scotian shelf cold water plume in the top 10 to 15 meters of the water column. The plume had higher (about 10-20%) DOM fluorescence than the rest of the water column. In general, the optics followed the hydrographic structure with depth, where DOM fluorescence and absorption were high when salinity was relatively low, and vice versa. Both DOM absorption and total absorption measurements were taken at this station.

At station 4 (4/14) in the Northeast channel, DOM fluorescence and DOM absorption were again relatively high in the surface mixed layer (>20 counts at EX265:EM490). As observed in the last station, the optics then decreased with depth at the same general rate and pattern as salinity increased with depth. There was, however, a peak at the base of the mixed layer (about 30 m), similar to what was repeatedly observed at station 1. As a result, we again used this optical feature as an important factor in tripping nets during the cast.

Station 5 (4/15), on the west flank of Georges Bank (Great South Channel), was also a station where the optics clearly contrasted with the hydrographic data in certain parts of the water column. Here, a DOM fluorescence peak was observed at about 100 to 110 m within an intermediate water mass. Below this layer, a sharp interface was observed in both the DOM fluorescence and absorption as well as the hydrography. From this profile, nets were triggered below the interface, within the interface (130 to 150 m), and within the intermediate layer with the unique optical signature.

Station 6 (4/16) was on the peak of Georges Bank (only about 40-50 meters total depth), and was well-mixed. DOM fluorescence was relatively high, averaging 23-24 counts at EX265:EM490. Chlorophyll fluorescence was very high at this station (several hundred at EX430EM685), and the nets contained very high concentrations of *Phaeocystis*.

At station 7 (4/16) we had a problem logging the SaFire fluorescence data, and unfortunately the DOM fluorescence measurements could not be salvaged. From our logs, however, it was noted that the fluorescence here showed little change through the water column (similar to the hydrography), and that the counts were notably less than the other stations (EX265:EM490 of less than 20 average counts). DOM absorption was measured and recorded here and the data shows the same pattern - consistently lower than the other stations, with little variation through the water column.

At station 8 (4/17), south of Georges Bank on the slope, DOM fluorescence and DOM absorption were both recorded. This station was similar in some respects to station 4, where the optics decreased with depth at the same general rate and pattern that salinity increased with depth, with the exception of the bottom of the mixed layer. DOM fluorescence peaked at the base of the mixed layer (about 45 m) with an average of 23 counts at EX265EM490, and then decreased to a constant 16 average counts by 150 m. Unique fluorescence features at the bottom of the mixed layer observed here and at stations 1, 4, and 5 are a new and intriguing set of observations which will hopefully be valuable in interpreting the macrozooplankton distributions observed during this cruise.

Personnel Lists

Scientific Party

1. Laurence Madin	WHOI	Chief Scientist
2. Dian Gifford	URI/GSO	Scientist
3. Karen Wishner	URI/GSO	Scientist
4. Grace Klein-MacPhee	URI/GSO	Scientist
5. Erich Horgan	WHOI	Res. Asst.
6. Mari Butler	SFSU	Res. Asst.
7. Terry Cucci	BLOS	Scientist
8. Jeff Merrell	URI/GSO	Res. Asst.
9. Dawn Outram	URI/GSO	Res. Asst.
10. Becky Coverdale	WHOI	Graduate Student
11, Mike Twardowski	URI/GSO	Graduate Student
12. Margaret Dekshenieks	URI/GSO	Graduate Student
13. Brian Blease	SFSU	volunteer
14. Tom Butler		volunteer
15. Dave Nelson	URI/GSO	Marine Tech

Ship's Officers and Crew

1. Thomas Tyler	Captain
2. Steve Vetra	1st Mate
3. Fenton Whitlow	2nd Mate
4. Bill Appleton	Chief Engineer
5. Jim Cobleigh	Asst. Engineer
6. Tim Varney	Asst. Engineer
7. Jack Buss	Bos'n

9. Ron Regnier	AB
10. Glen Prouty	AB
11. Dan Butler	Steward
12. Dave Philbrick	Messman

Appendices

1. Event Log

Data

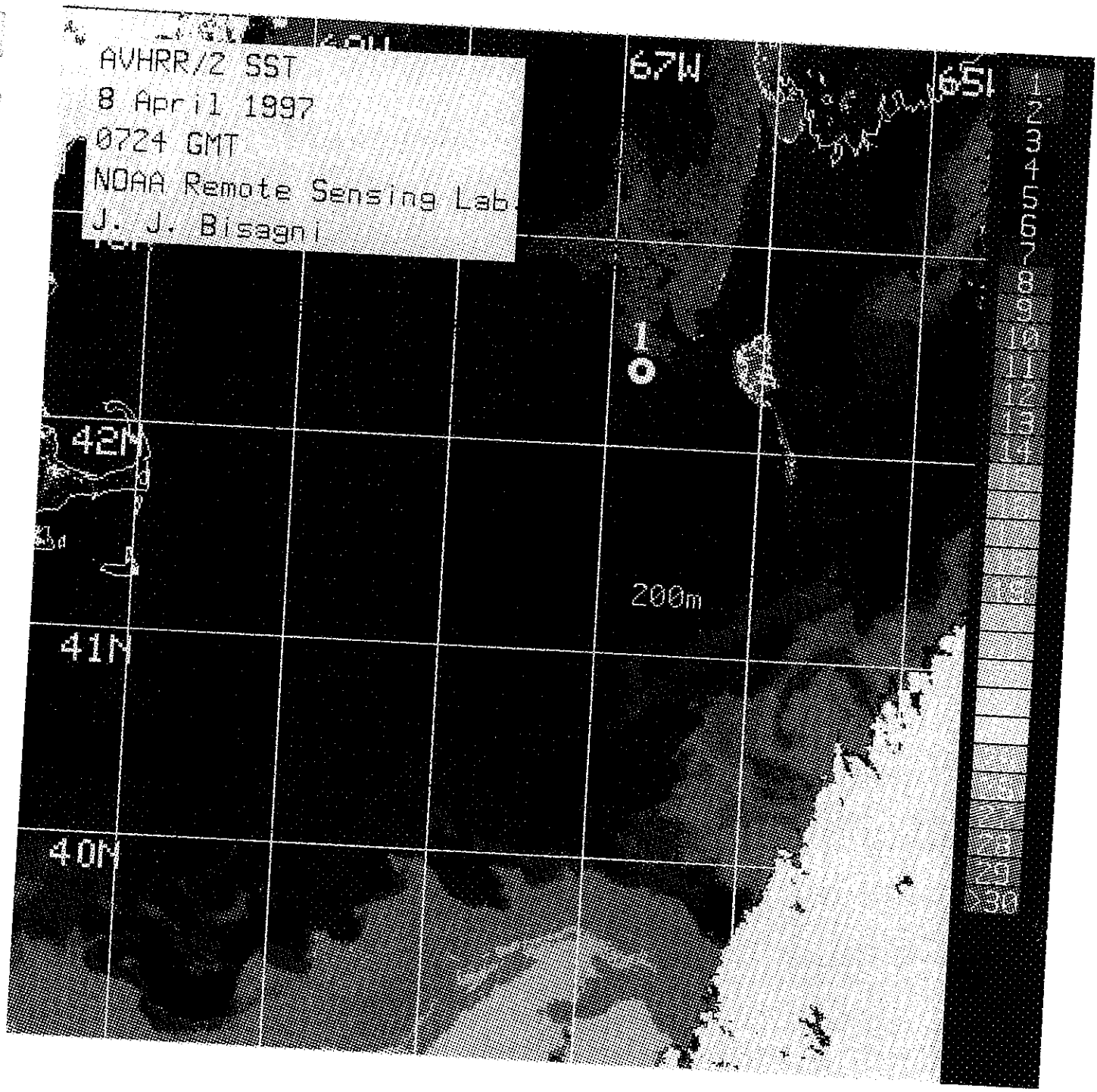
eventno	Instr	cast#	Sta#	Sta_std	L Mth	O Day	C A L hhmm	s/e	Lat	Lon	Water Depth	Cast Depth	PI	Region	Comments
EN9897.1	SeabirdCTD	1	1	0	4	8	1755	s	4225.03	6647.92	359	300	Gifford	Georges Basin	initial profile for Sta 1.
EN9897.2	SeabirdCTD	1	1	0	4	8	1826	e	4225.03	6647.92	359	300	Gifford	Georges Basin	
EN9897.3	SeabirdCTD	2	1	0	4	8	1905	s	4225.14	6647.60	359	25	Gifford	Georges Basin	water collection for Gifford expts
EN9897.4	SeabirdCTD	2	1	0	4	8	1915	e	4225.14	6647.60	359	25	Gifford	Georges Basin	
EN9897.5	MOC10	1	1	0	4	8	2044	s	4225.37	6647.68	359	340	Madin	Georges Basin	lost all 5 codend buckets and 3 collars, no samples.
EN9897.6	MOC10	1	1	0	4	8	2144	e	4226.01	6657.41	359	340	Madin	Georges Basin	
EN9997.1	MOC1	201	1	0	4	9	14	s	4224.63	6647.30	357	332	Wishner	Georges Basin	Safire
EN9997.2	MOC1	201	1	0	4	9	150	e	4225.49	6650.48	362	332	Wishner	Georges Basin	
EN9997.3	MOC1	202	1	0	4	9	351	s	4225.08	6648.16	360	332	Wishner	Georges Basin	
EN9997.4	MOC1	202	1	0	4	9	445	e	4226.08	6649.09	360	332	Wishner	Georges Basin	
EN9997.5	MOC10	2	1	0	4	9	900	s	4225.16	6648.34	359	300	Madin	Georges Basin	all went smoothly
EN9997.6	MOC10	2	1	0	4	9	946	e	4226.02	6650.21	354	300	Madin	Georges Basin	
EN9997.7	MOC10	3	1	0	4	9	1056	s	4225.25	6648.58	361	300	Madin	Georges Basin	all went smoothly; conductivity pins above 70 m
EN9997.8	MOC10	3	1	0	4	9	1141	e	4226.24	6650.24	342	300	Madin	Georges Basin	ollection for Gifford expts, Phaeocystis layer at 70 m
EN9997.9	SeabirdCTD	3	1	0	4	9	1209	s	4225.80	6649.92	358	25	Gifford	Georges Basin	ollection for Gifford expts, Phaeocystis layer at 70 m
EN9997.10	SeabirdCTD	3	1	0	4	9	1219	e	4225.80	6649.92	358	25	Gifford	Georges Basin	
EN9997.11	MOC1	203	1	0	4	9	1331	s	4225.33	6648.41	343	338	Wishner	Georges Basin	
EN9997.12	MOC1	203	1	0	4	9	1514	e	4227.01	6650.40	343	338	Wishner	Georges Basin	
EN9997.13	ZPN	1	1	0	4	9	1530	s	4226.63	6649.76	348	100	Gifford	Georges Basin	
EN9997.14	ZPN	1	1	0	4	9	1600	e	4226.63	6649.76	348	100	Gifford	Georges Basin	
EN9997.15	Reeve net	1	1	0	4	9	1700	s	4226.03	6648.40	360	50	Madin	Georges Basin	
EN9997.16	Reeve net	1	1	0	4	9	1730	e	4226.03	6648.40	360	50	Madin	Georges Basin	
EN10097.1	SeabirdCTD	4	2	0	4	10	605	s	4150.88	6630.17	80	70	Gifford	Georges Basin	profile and water collection for Gifford expts
EN10097.2	SeabirdCTD	4	2	0	4	10	645	e	4150.88	6630.17	80	70	Gifford	Georges Basin	
EN10097.3	ZPN	2	2	0	4	10	1300	s	4153.20	6632.00	85	50	Gifford	Georges Basin	
EN10097.4	ZPN	2	2	0	4	10	1315	e	4153.20	6632.00	85	50	Gifford	Georges Basin	
EN10097.5	Reeve net	2	2	0	4	10	1415	s	4153.41	6629.64	84	50	Madin	Mixed	nt net ring and kinked wire, mainly copepods caught
EN10097.6	Reeve net	2	2	0	4	10	1440	e	4153.41	6629.64	84	50	Madin	Mixed	
EN10097.7	MOC1	204	2	0	4	10	2022	s	4150.90	6630.34	86	60	Wishner	Bank mixed	
EN10097.8	MOC1	204	2	0	4	10	2039	e	4150.93	6631.36	86	60	Wishner	Bank mixed	
EN10197.1	SeabirdCTD	5	2	0	4	11	700	s	4150.66	6629.97	81	70	Gifford	cold plume	
EN10197.2	SeabirdCTD	5	2	0	4	11	730	e	4150.66	6629.97	81	70	Gifford	cold plume	
EN10197.3	MOC1	205	2	0	4	11	824	s	4150.82	6630.06	80	76	Wishner	Bank mixed	
EN10197.4	MOC1	205	2	0	4	11	850	e	4150.11	6631.61	80	76	Wishner	Bank mixed	
EN10197.5	MOC10	4	2	0	4	11	1011	s	4151.18	6629.83	83	60	Madin	Mixed	
EN10197.6	MOC10	4	2	0	4	11	1037	e	4151.79	6632.59	77	60	Madin	Mixed	
EN10197.7	MOC10	5	2	0	4	11	1230	s	4151.26	6630.56		81	Madin	Mixed	offset 2m at surface, depths corrected for offset
EN10197.8	MOC10	5	2	0	4	11	1305	e	4153.40	6632.00		81	Madin	Mixed	
EN10197.9	ZPN	3	2	0	4	11	1320	s	4153.40	6632.00	250	50	Gifford	cold plume	
EN10197.10	ZPN	3	2	0	4	11	1335	e	4153.40	6632.00	250	50	Gifford	cold plume	
EN10197.11	ZPN	4	2	0	4	11	1340	s	4153.40	6632.00	250	25	Gifford	cold plume	
EN10197.12	ZPN	4	2	0	4	11	1353	e	4153.40	6632.00	250	25	Gifford	cold plume	
EN10197.13	ZPN	5	2	0	4	11	1355	s	4154.00	6631.00	80	60	Gifford	cold plume	
EN10197.14	ZPN	5	2	0	4	11	1409	e	4154.00	6631.00	80	60	Gifford	cold plume	
EN10197.15	ZPN	6	2	0	4	11	1415	s	4154.29	6630.63			Klein-MacPhee	cold plume	
EN10197.16	ZPN	6	2	0	4	11	1424	e	4154.29	6630.63			Klein-MacPhee	cold plume	
EN10197.17	SCUBA	1	3	0	4	11	1513	s	4155.00	6628.70	80	20	Madin	Mixed	collection of Pleurobrachia
EN10197.18	SCUBA	1	3	0	4	11	1540	e	4155.00	6628.70	80	20	Madin	Mixed	
EN10197.19	MOC10	6	2	0	4	11	2026	s	4150.81	6630.08	81	60	Madin	Mixed	
EN10197.20	MOC10	6	2	0	4	11	2050	e	4150.96	6631.73	81	60	Madin	Mixed	
EN10197.21	MOC10	7	2	0	4	11	2216	s	4150.90	6630.13	78	60	Madin	Mixed	
EN10197.22	MOC10	7	2	0	4	11	2242	e	4151.53	6631.45	78	60	Madin	Mixed	
EN10297.1	SeabirdCTD	6	2	0	4	12	208	s	4206.26	6615.82	84	80	Gifford	cold plume	

					L	O	C A L				Water	Cast			
eventno	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
EN10297.2	SeabirdCTD	6	2	0	4	12	238	e	4206.26	6615.82	84	80	Gifford	cold plume	
EN10297.3	MOC1	206	3	0	4	12	340	s	4158.89	6615.53	83	61	Wishner	cold plume	
EN10297.4	MOC1	206	3	0	4	12	418	e	4159.47	6615.55	83	61	Wishner	cold plume	
EN10297.5	SeabirdCTD	7	2	0	4	12	540	s	4158.99	6612.87	89	10	Gifford	cold plume	
EN10297.6	SeabirdCTD	7	2	0	4	12	558	e	4200.00	6615.80	89	10	Gifford	cold plume	
EN10297.7	SeabirdCTD	8	3	0	4	12	717	s	4159.72	6615.75	83	70	Gifford	cold plume	
EN10297.8	SeabirdCTD	8	3	0	4	12	747	e	4159.72	6615.75	83	70	Gifford	cold plume	
EN10297.9	MOC1	207	3	0	4	12	815	s	4159.70	6615.80	83	61	Wishner	cold plume	
EN10297.10	MOC1	207	3	0	4	12	852	e	4159.70	6616.56	82	61	Wishner	cold plume	
EN10297.11	MOC1	208	3	0	4	12	1026	s	4200.42	6615.51	82	41	Wishner	cold plume	
EN10297.12	MOC1	208	3	0	4	12	1109	e	4201.48	6616.34	85	41	Wishner	cold plume	
EN10297.13	MOC10	8	3	0	4	12	1230	s	4200.74	6616.87	82	70	Madin	cold plume	TEAC tape not running
EN10297.14	MOC10	8	3	0	4	12	1304	e	4202.32	6619.10	87	70	Madin	cold plume	
EN10297.15	SCUBA	2	3	0	4	12	1424	s	4205.60	6619.60	80	25	Madin	cold plume	visual layering of cold plume
EN10297.16	SCUBA	2	3	0	4	12	1458	e	4205.60	6619.60	80	25	Madin	cold plume	
EN10297.17	ZPN	7	3	0	4	12	1633	s	4200.00	6615.40			Klein-MacPhee	cold plume	
EN10297.18	ZPN	7	3	0	4	12	1710	e	4200.60	6614.20			Klein-MacPhee	cold plume	
EN10297.19	MOC10	9	3	0	4	12	1800	s	4200.06	6615.11	83	70	Madin	cold plume	
EN10297.20	MOC10	9	3	0	4	12	1830	e	4200.72	6614.33	83	70	Madin	cold plume	
EN10297.21	SeabirdCTD	9	3	0	4	12	1900	s	4200.54	6613.42	87	77	Gifford	cold plume	
EN10297.22	SeabirdCTD	9	3	0	4	12	1919	e	4200.54	6613.42	87	77	Gifford	cold plume	
EN10297.23	MOC10	10	3	0	4	12	2037	s	4155.73	6608.28	96	80	Madin	cold plume	
EN10297.24	MOC10	10	3	0	4	12	2113	e	4153.84	6607.15	95	80	Madin	cold plume	
EN10297.25	MOC10	11	3	0	4	12	2211	s	4153.17	6606.94	96	80	Madin	cold plume	
EN10297.26	MOC10	11	3	0	4	12	2242	e	4152.02	6606.33	97	80	Madin	cold plume	
EN10397.1	MOC1	209	3	0	4	13	28	s	4153.63	6608.06	96	61	Wishner	cold plume	
EN10397.2	MOC1	209	3	0	4	13	107	e	4152.78	6607.73	95	61	Wishner	cold plume	
EN10397.3	SeabirdCTD	10	3	0	4	13	714	s	4153.46	6608.53	94	57	Gifford	cold plume	
EN10397.4	SeabirdCTD	10	3	0	4	13	734	e	4153.46	6608.53	94	57	Gifford	cold plume	
EN10397.5	SeabirdCTD	11	3	0	4	13	1043	s	4202.13	6605.94	98	80	Gifford	cold plume	
EN10397.6	SeabirdCTD	11	3	0	4	13	1100	e	4202.13	6605.94	98	80	Gifford	cold plume	
EN10397.7	MOC1	210	3	0	4	13	1415	s	4202.05	6605.23	84	61	Wishner	cold plume	
EN10397.8	MOC1	210	3	0	4	13	1453	e	4201.89	6603.94	84	61	Wishner	cold plume	
EN10397.9	MOC10	12	3	0	4	13	1556	s	4201.35	6602.93	99	80	Madin	cold plume	station 3a, NE of sta 3, following cold plume
EN10397.10	MOC10	12	3	0	4	13	1627	e	4200.70	6602.71	101	80	Madin	cold plume	
EN10497.1	SeabirdCTD	12	4	0	4	14	700	s	4219.99	6559.96	249	237	Gifford	NE Channel	
EN10497.2	SeabirdCTD	12	4	0	4	14	727	e	4219.99	6559.96	249	237	Gifford	NE Channel	
EN10497.3	MOC1	211	4	0	4	14	906	s	4219.31	6559.50	249	248	Wishner	NE Channel	
EN10497.4	MOC1	211	4	0	4	14	1013	e	4216.95	6558.14	249	248	Wishner	NE Channel	
EN10497.5	MOC10	13	4	0	4	14	1226	s	4219.87	6600.60	255	230	Madin	NE Channel	2 net bars up on recovery, net 4 DNF
EN10497.6	MOC10	13	4	0	4	14	1332	e	4217.33	6601.15	252	230	Madin	NE Channel	
EN10497.7	ZPN	8	4	0	4	14	1430	s	4219.90	6600.20			Klein-MacPhee	NE Channel	
EN10497.8	ZPN	8	4	0	4	14	1445	e	4219.90	6600.20			Klein-MacPhee	NE Channel	
EN10497.9	MOC1	212	4	0	4	14	2019	s	4220.53	6559.84	248	221	Wishner	NE Channel	
EN10497.10	MOC1	212	4	0	4	14	2142	e	4223.22	6558.40	236	221	Wishner	NE Channel	
EN10497.11	MOC10	14	4	0	4	14	2246	s	4220.39	6600.00	250	230	Madin	BongoGrid	changed battery
EN10497.12	MOC10	14	4	0	4	14	2341	e	4222.45	6559.35	248	230	Madin	BongoGrid	
EN10597.1	SeabirdCTD	13	5	0	4	15	1238	s	4140.05	6830.07	174	162	Gifford	GSC	
EN10597.2	SeabirdCTD	13	5	0	4	15	1300	e	4140.05	6830.07	174	162	Gifford	GSC	
EN10597.3	MOC10	15	5	0	4	15	1340	s	4140.41	6830.79	183	160	Madin	GSC	
EN10597.4	MOC10	15	5	0	4	15	1414	e	4141.92	6831.17	176	160	Madin	GSC	
EN10597.5	MOC1	213	5	0	4	15	1448	s	4142.72	6831.38	172	151	Wishner	GSC	
EN10597.6	MOC1	213	5	0	4	15	1546	e	4144.86	6832.02	172	151	Wishner	GSC	
EN10597.7	SCUBA	3	5	0	4	15	1628	s	4144.94	6832.04	150	25	Madin	GSC	

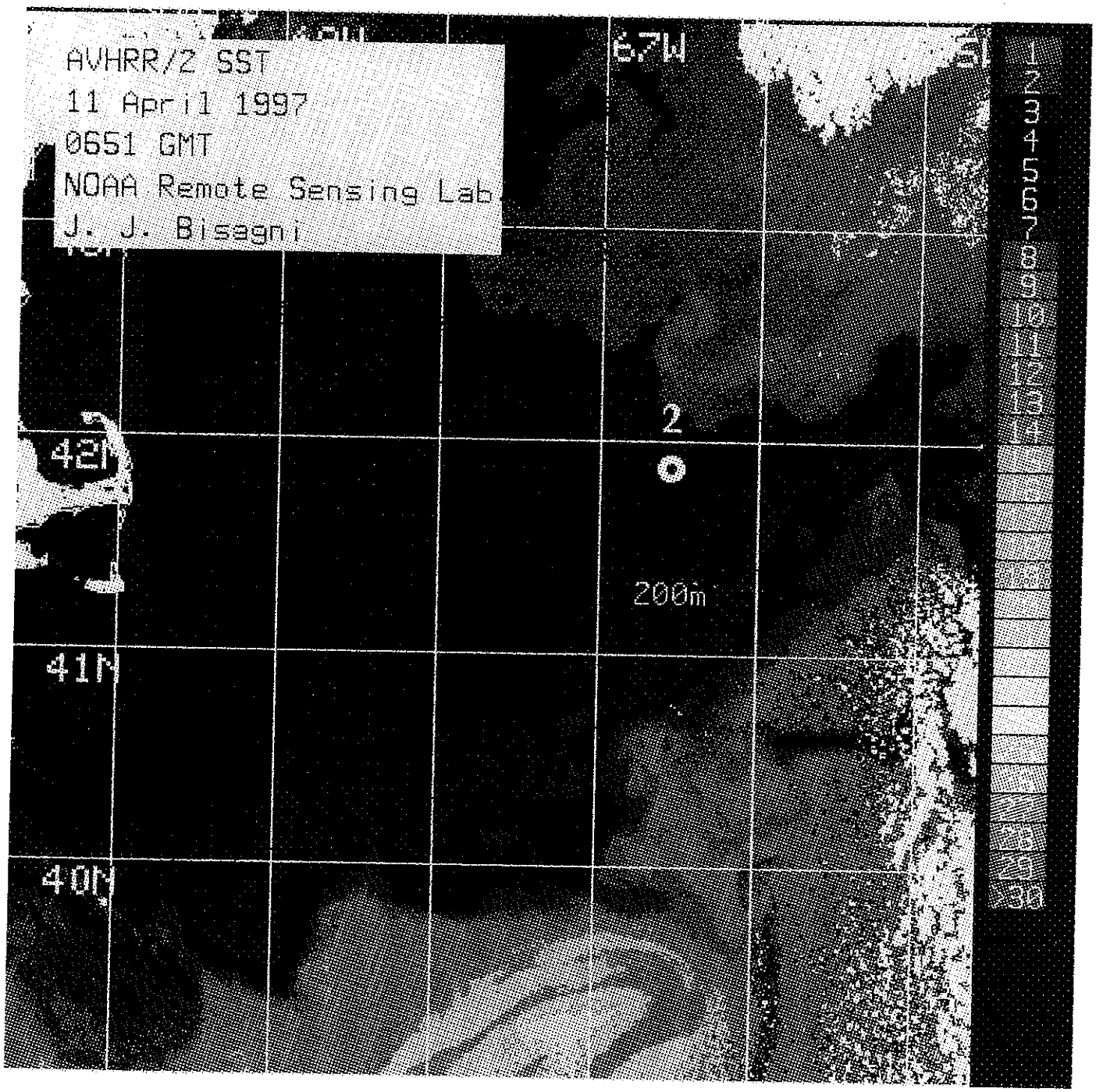
					L	O	C A L				Water	Cast			
eventno	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
EN10597.8	SCUBA	3	5	0	4	15	1654	e	4140.00	6830.00	150	25	Madin	GSC	
EN10597.9	ZPN	9	4	0	4	15	1807	s	4140.00	6830.00			Klein-MacPhee	GSC	
EN10597.10	ZPN	9	4	0	4	15	1828	e	4140.00	6830.00			Klein-MacPhee	GSC	
EN10597.11	MOC1	214	5	0	4	15	2005	s	4139.91	6830.13	175	25	Wishner	GSC	
EN10597.12	MOC1	214	5	0	4	15	2057	e	4140.11	6832.05	181	151	Wishner	GSC	
EN10597.13	MOC10	16	5	0	4	15	2319	s	4139.99	6829.55	171	160	Madin	GSC	
EN10597.14	MOC10	16	5	0	4	15	2359	e	4140.01	6831.51	180	160	Madin	GSC	
EN10697.1	MOC10	17	5	0	4	16	107	s	4140.20	6830.20	178	160	Madin	GSC	
EN10697.2	MOC10	17	5	0	4	16	141	e	4140.63	6831.59	181	160	Madin	GSC	
EN10697.3	SeabirdCTD	14	5	0	4	16	658	s	4139.91	6830.16	175	25	Gifford	GSC	
EN10697.4	SeabirdCTD	14	5	0	4	16	720	e	4139.91	6830.16	175	25	Gifford	GSC	
EN10697.5	ZPN	10	5	0	4	16	757	s	4139.94	6830.10		80	Klein-MacPhee	GSC	
EN10697.6	ZPN	10	5	0	4	16	831	e	4140.05	6829.94		80	Klein-MacPhee	GSC	
EN10697.7	MOC1	215	5	0	4	16	845	s	4140.11	6830.13	175	151	Wishner	GSC	
EN10697.8	MOC1	215	5	0	4	16	936	e	4140.26	6832.05	181	151	Wishner	GSC	
EN10697.9	MOC10	18	5	0	4	16	1100	s	4139.99	6830.07	174	160	Madin	GSC	
EN10697.10	MOC10	18	5	0	4	16	1137	e	4140.01	6831.77	181	160	Madin	GSC	
EN10697.11	SeabirdCTD	15	6	0	4	16	1602	s	4111.98	6758.00	51	45	Gifford	Bank crest	
EN10697.12	SeabirdCTD	15	6	0	4	16	1622	e	4111.98	6758.00	51	45	Gifford	Bank crest	
EN10697.13	MOC1	216	6	0	4	16	1624	s	4112.38	6758.21	48	26	Wishner	Bank crest	
EN10697.14	MOC1	216	6	0	4	16	1646	e	4112.27	6758.16	51	26	Wishner	Bank crest	
EN10697.15	MOC10	19	6	0	4	16	1757	s	4113.13	6758.18	58	45	Madin	Bank crest	
EN10697.16	MOC10	19	6	0	4	16	1830	e	4112.95	6758.33	55	45	Madin	Bank crest	replicate nets in same tow
EN10697.17	SeabirdCTD	16	7	0	4	16	2140	s	4044.98	6759.86	77	68	Gifford	South Flank	
EN10697.18	SeabirdCTD	16	7	0	4	16	2200	e	4044.97	6759.86	77	68	Gifford	South Flank	
EN10697.19	MOC1	217	7	0	4	16	2211	s	4044.72	6759.70	79	56	Wishner	South Flank	
EN10697.20	MOC1	217	7	0	4	16	2245	e	4043.98	6800.41	80	56	Wishner	South Flank	
EN10697.21	MOC1	218	7	0	4	16	2355	s	4044.87	6800.16	77	56	Wishner	South Flank	
EN10797.1	MOC1	218	7	0	4	17	25	e	4044.43	6801.13	78	56	Wishner	South Flank	
EN10797.2	MOC10	20	7	0	4	17	138	s	4044.72	6759.65	78	65	Madin	South Flank	
EN10797.3	MOC10	20	7	0	4	17	202	e	4044.28	6801.16	79	65	Madin	South Flank	
EN10797.4	MOC10	21	7	0	4	17	258	s	4044.70	6800.24	78	65	Madin	South Flank	
EN10797.5	MOC10	21	7	0	4	17	331	e	4043.88	6801.43	61	65	Madin	South Flank	
EN10797.6	SeabirdCTD	17	7	0	4	17	708	s	4044.82	6759.99	78	65	Gifford	South Flank	
EN10797.7	SeabirdCTD	17	7	0	4	17	717	e	4044.82	6759.99	78	65	Gifford	South Flank	
EN10797.8	ZPN	11	7	0	4	17	809	s	4045.00	6759.99			Klein-MacPhee	South Flank	
EN10797.9	ZPN	11	7	0	4	17	824	e	4045.00	6759.99			Klein-MacPhee	South Flank	
EN10797.10	MOC1	219	7	0	4	17	911	s	4044.72	6800.32	80	58	Wishner	South Flank	
EN10797.11	MOC1	219	7	0	4	17	945	e	4043.92	6800.93	77	58	Wishner	South Flank	
EN10797.12	MOC1	220	7	0	4	17	1104	s	4044.85	6800.03	80	58	Wishner	South Flank	
EN10797.13	MOC1	220	7	0	4	17	1135	e	4043.84	6800.57	81	58	Wishner	South Flank	
EN10797.14	MOC10	22	7	0	4	17	1250	s	4044.91	6800.43	77	65	Madin	South Flank	
EN10797.15	MOC10	22	7	0	4	17	1319	e	4043.53	6801.02	81	65	Madin	South Flank	
EN10797.16	SeabirdCTD	18	7	0	4	17	1333	s	4043.20	6801.00	81	78	Wishner	South Flank	
EN10797.17	SeabirdCTD	18	7	0	4	17	1353	e	4042.60	6800.90	81	78	Wishner	South Flank	
EN10797.18	SeabirdCTD	19	8	0	4	17	1912	s	4014.92	6814.89	313	275	Gifford	Slope	
EN10797.19	SeabirdCTD	19	8	0	4	17	1936	e	4014.92	6814.89	313	275	Gifford	Slope	
EN10797.20	MOC10	23	8	0	4	17	2039	s	4015.46	6814.54	271	275	Madin	Slope	
EN10797.21	MOC10	23	8	0	4	17	2146	e	4013.31	6816.34	815	275	Madin	Slope	flowmeter failure on most nets
EN10797.22	MOC1	221	8	0	4	17	2244		4014.78	6815.09	365	250	Wishner	Slope	
EN10897.1	MOC1	221	8	0	4	18	5		4012.90	6817.10	506	250	Wishner	Slope	
EN10897.2	MOC10	24	8	0	4	18	622	s	4015.11	6815.08	325	265	Madin	Slope	
EN10897.3	MOC10	24	8	0	4	18	714	e	4013.98	6831.52	293	265	Madin	Slope	may have grazed bottom with net 0

2. Surface Temperature Images

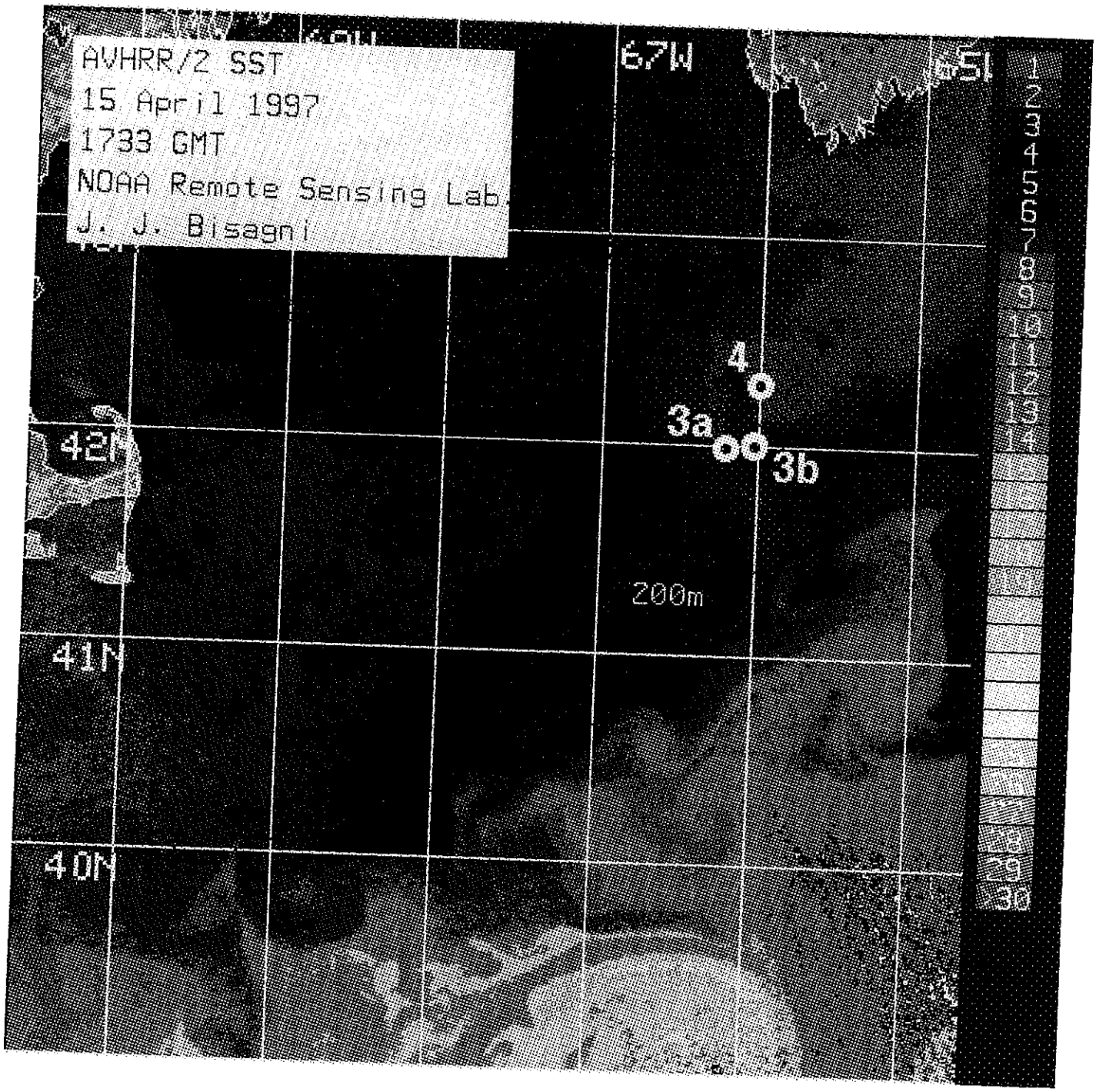
Station 1. April 8-9, 42° 25'N 66° 48'W


AVHRR/2 SST
8 April 1997
0724 GMT
NOAA Remote Sensing Lab.
J. J. Bisagni
67W
65
42N
41N
40N
200m
1 2 3 4 5 6 7 8 9 10 11
cold
warm

Station 2. April 10-11, 41° 52'N 66° 30'W


AVHRR/2 SST
11 April 1997
0651 GMT
NOAA Remote Sensing Lab.
J. J. Bisagni
6.7W
42N
41N
40N
200m
2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Station 3a. April 12-13, 42° 00'N 66° 16'W
3b. April 13, 42° 02'N 66° 06'W
4. April 14-15, 42° 20'N 66° 00'W


AVHRR/2 SST
15 April 1997
1733 GMT
NOAA Remote Sensing Lab.
J. J. Bisagni
67W
42N
41N
40N
200m
4
3a
3b
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
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30

Station 5. April 15, 41° 40'N 68° 30'W
6. April 16, 41° 12'N 67° 58'W
7. April 16-17, 40° 45'N 68° 00'W
8. April 17-18, 40° 15'N 68° 15'W

AVHRR/2 SST
16 April 1997
1724 GMT
NOAA Remote Sensing Lab.
J. J. Bisagni
67W
42N
41N
40N
200m
5
6
7
8
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

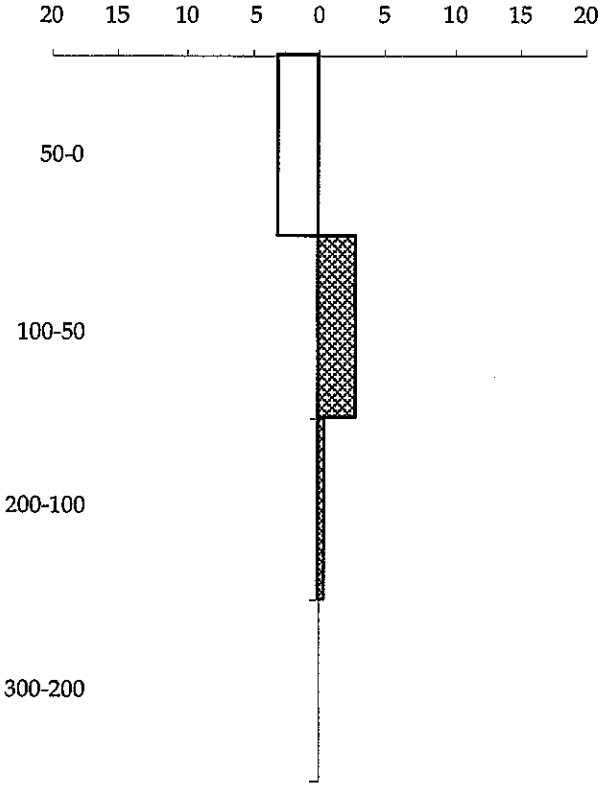
MOC-10 tow summary

These preliminary data are based on shipboard counts of trawl samples made by Mari Butler and Larry Madin immediately before preservation of the sample. **They are not considered final or definitive with respect either to quantitative accuracy or identification of taxa.** Full sorting and identification will be done with the preserved samples.

Summary plots of vertical distributions of major predator species. Day (open) and night (shaded) abundances are plotted for the most abundant groups at the stations where they occurred.

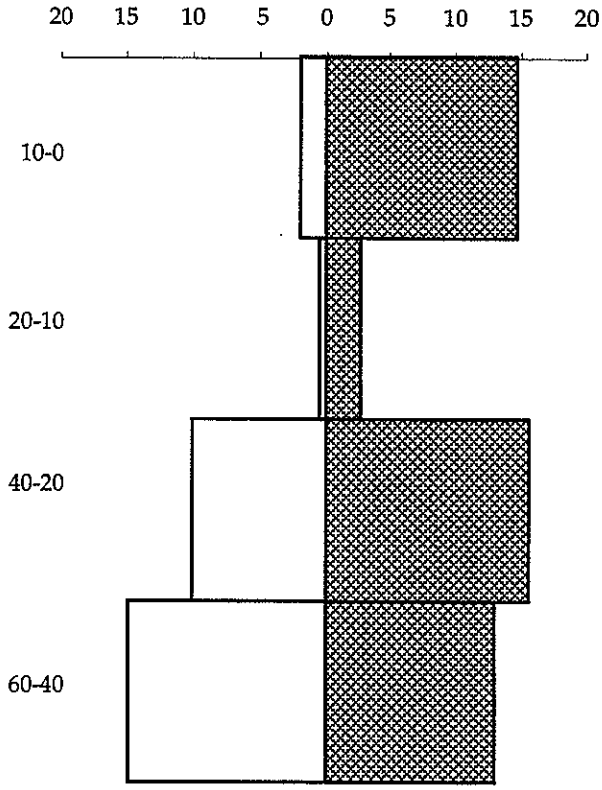
North East Channel

Pleurobrachia pileus /1000m^3



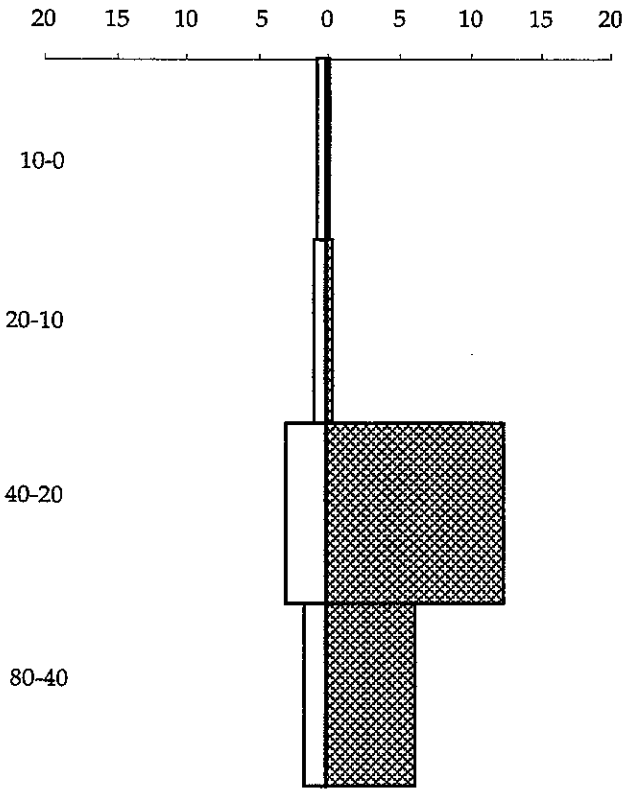
Bank Mixed

Pleurobrachia pileus /1000m^3



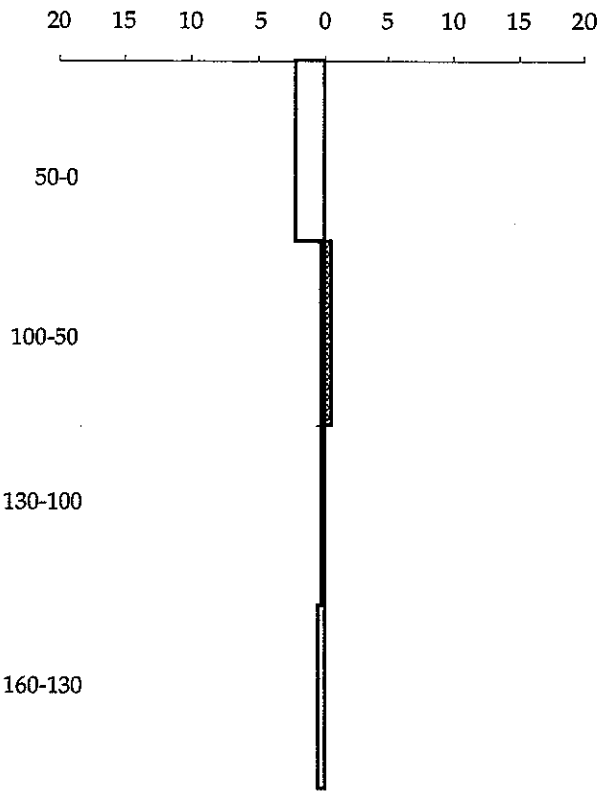
NE Peak/Cold Plume

Pleurobrachia pileus /1000m^3



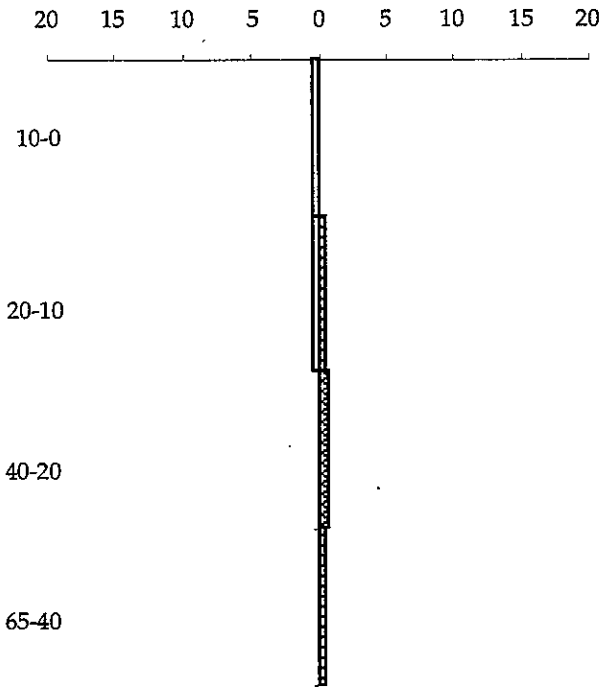
Great South Channel

Pleurobrachia pileus /1000m^3



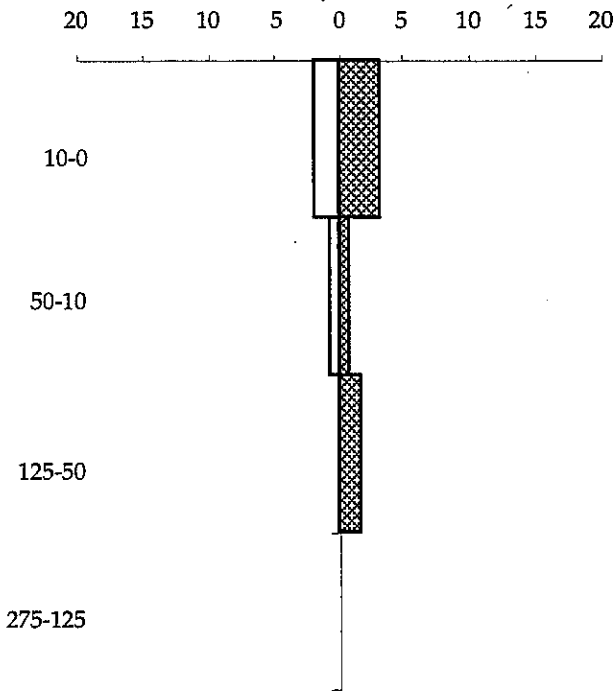
Southern Flank

Pleurobrachia pileus /1000m^3



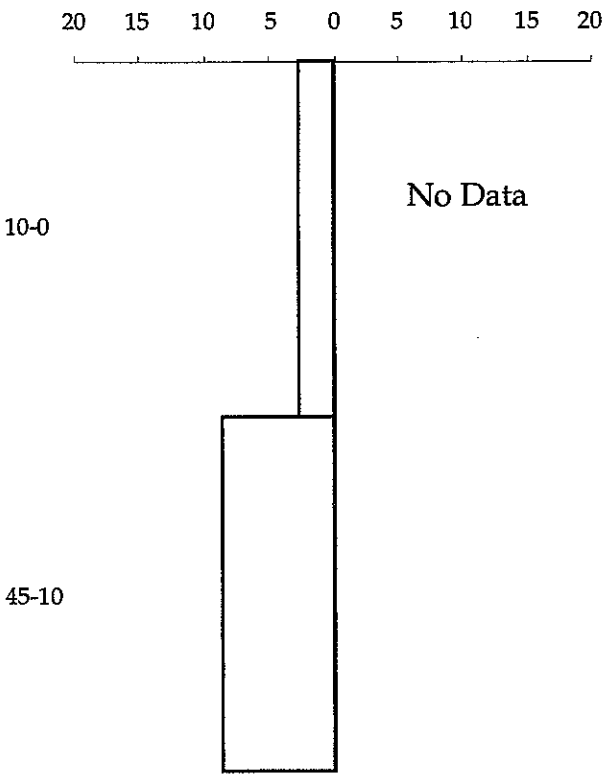
Slope Water

Pleurobrachia pileus /1000m^3



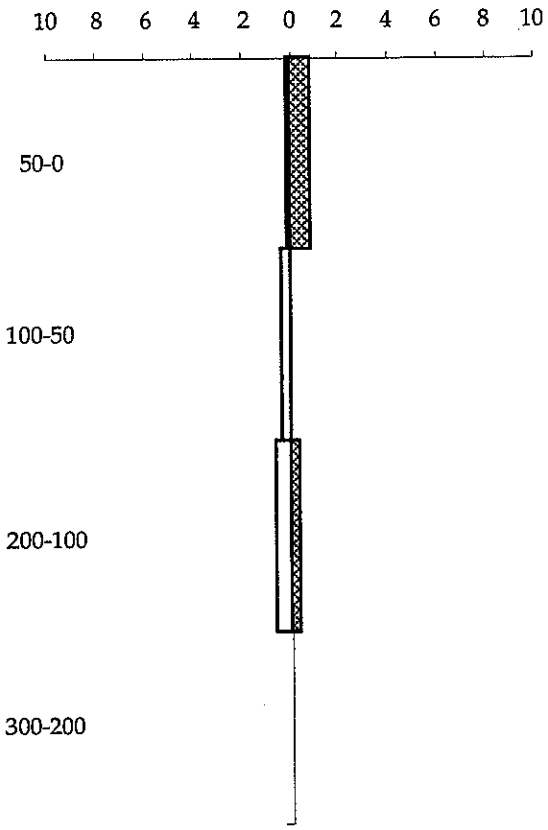
Bank Crest

Pleurobrachia pileus /1000m^3



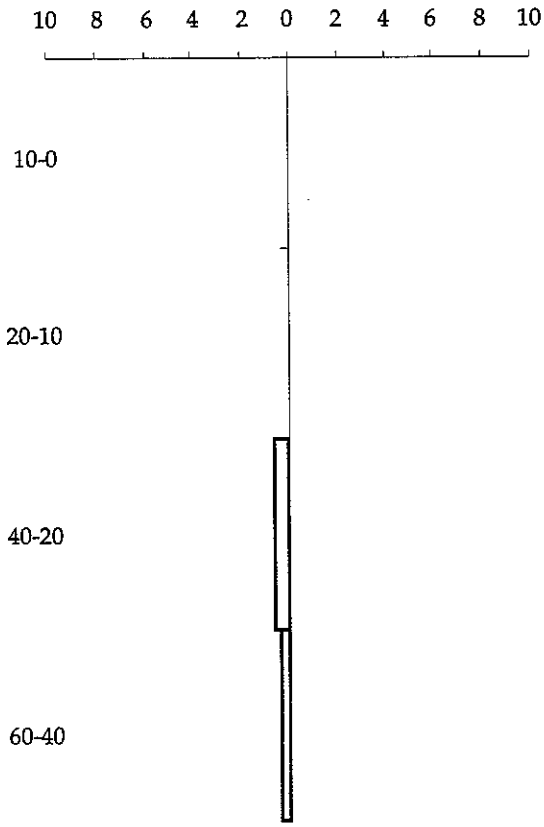
North East Channel

Clione limacina /1000m^3



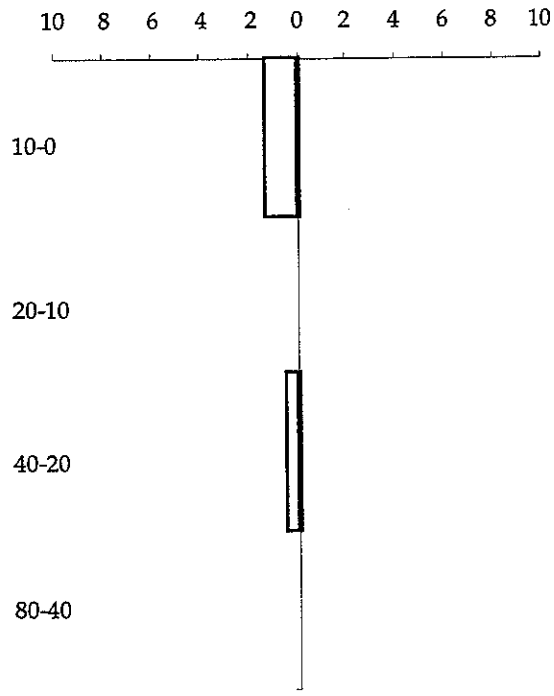
Bank Mixed

Clione limacina /1000m^3



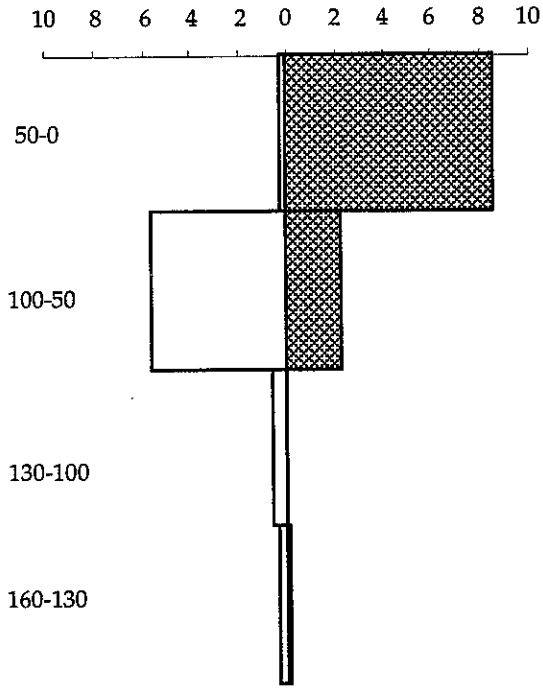
NE Peak/Cold Plume

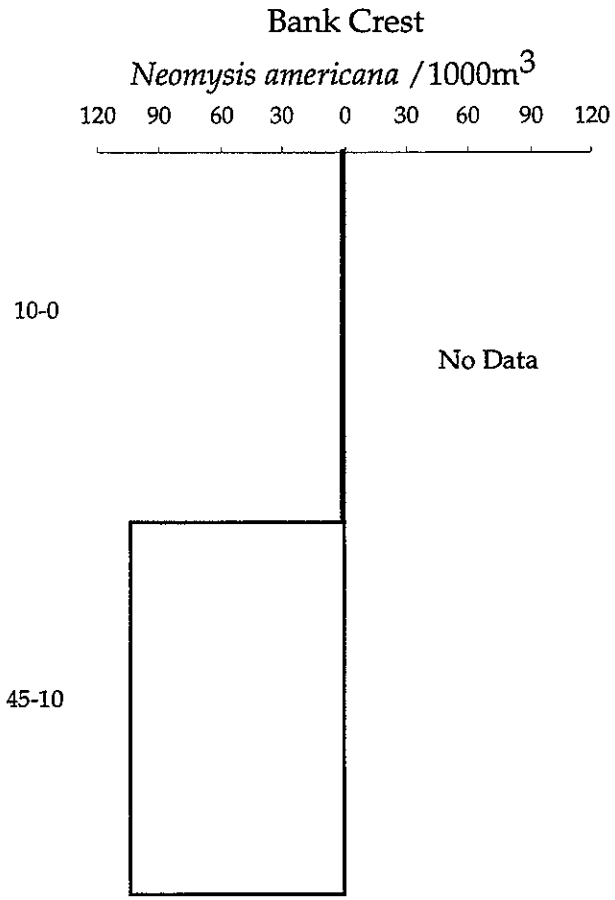
Clione limacina /1000m^3

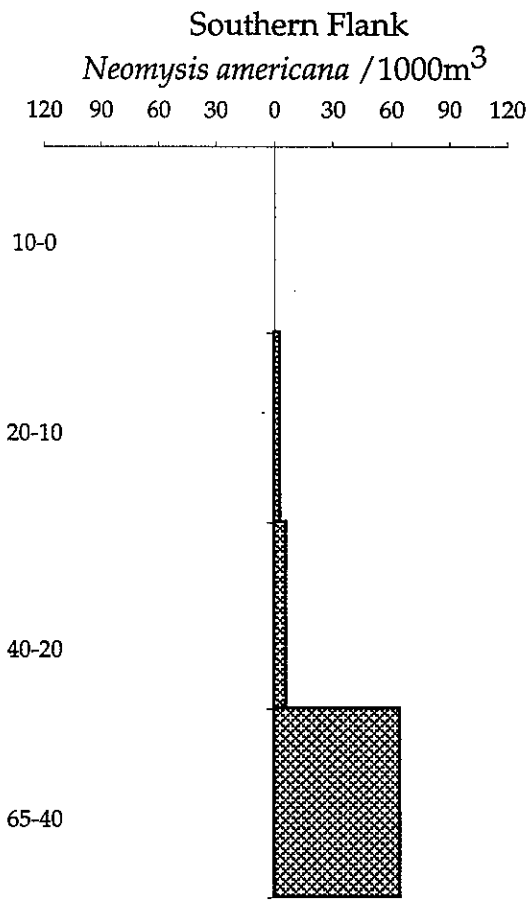


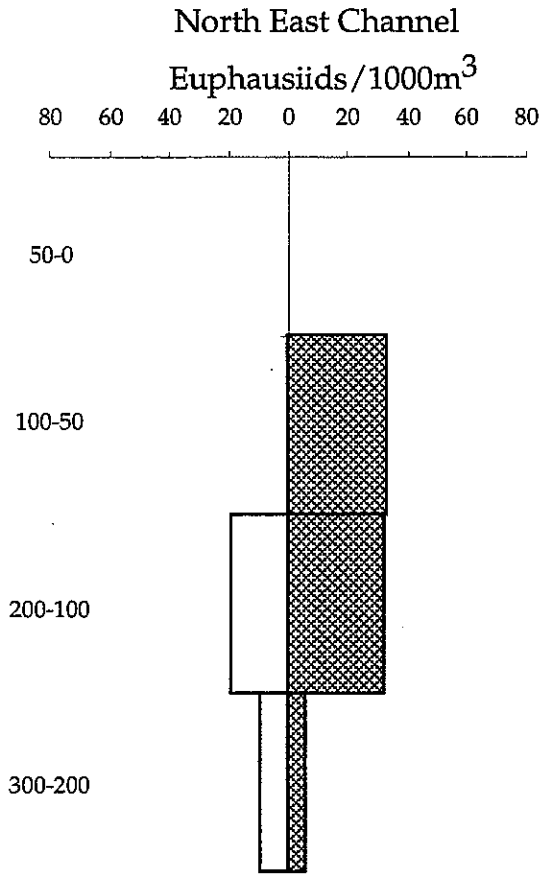
Great South Channel

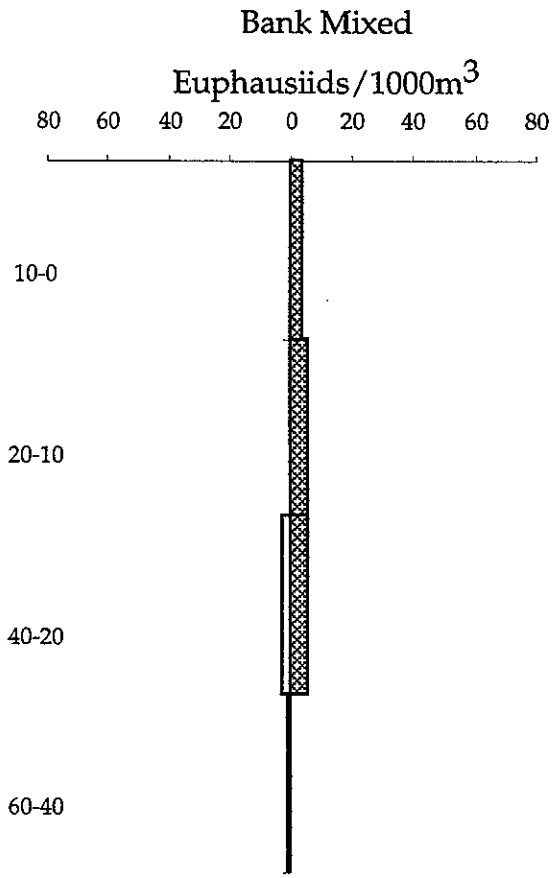
Clione limacina /1000m^3

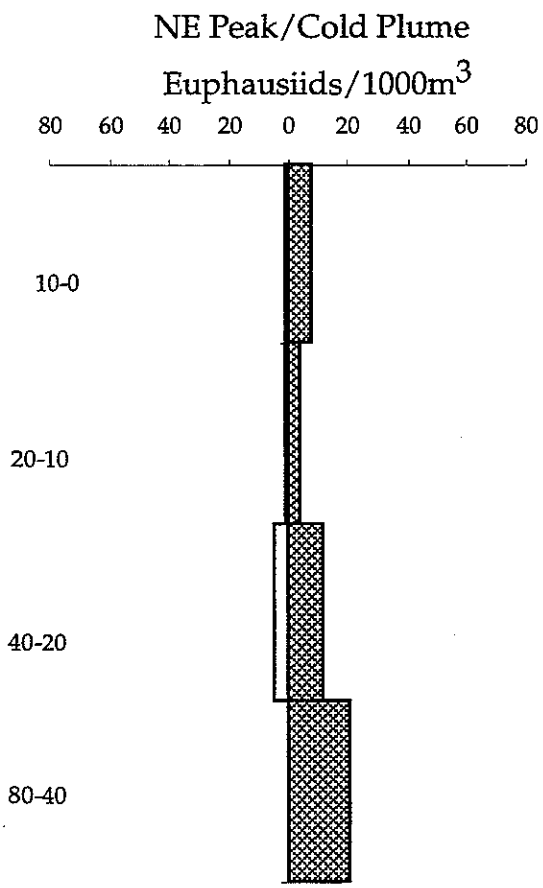


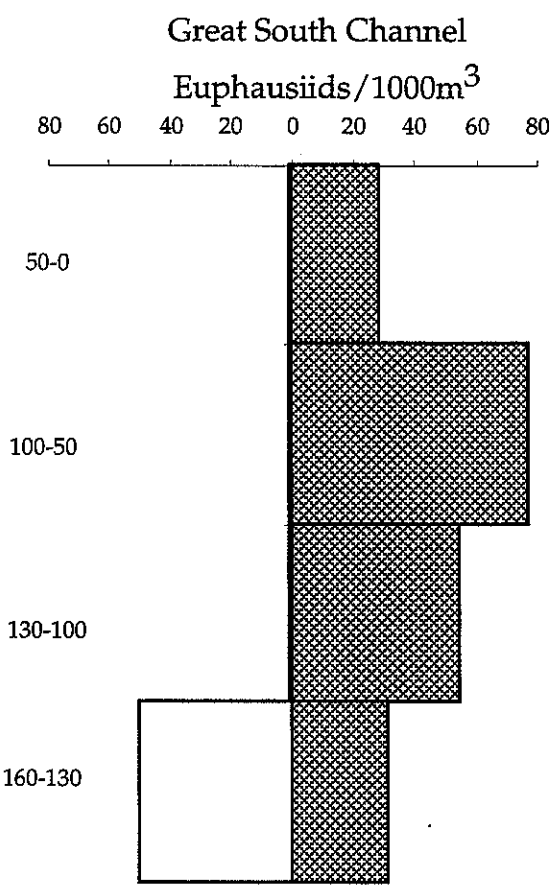

Bank Crest
Neomysis americana /1000m^3
120 90 60 30 0 30 60 90 120
10-0
No Data
45-10


Southern Flank
Neomysis americana /1000m^3
120 90 60 30 0 30 60 90 120
10-0
20-10
40-20
65-40


North East Channel
Euphausiids/1000m3
80 60 40 20 0 20 40 60 80
50-0
100-50
200-100
300-200

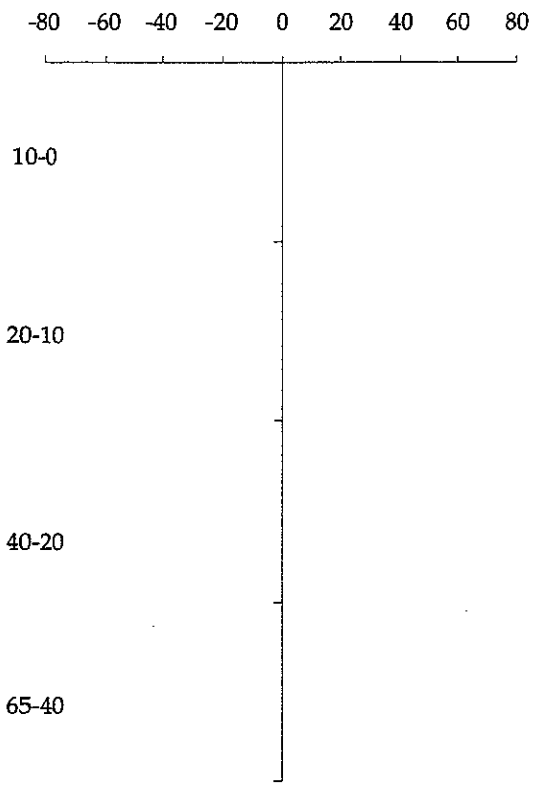

Bank Mixed
Euphausiids/1000m3
80 60 40 20 0 20 40 60 80
10-0
20-10
40-20
60-40


NE Peak/Cold Plume
Euphausiids/1000m3
80 60 40 20 0 20 40 60 80
10-0
20-10
40-20
80-40


Great South Channel
Euphausiids/1000m3
80 60 40 20 0 20 40 60 80
50-0
100-50
130-100
160-130

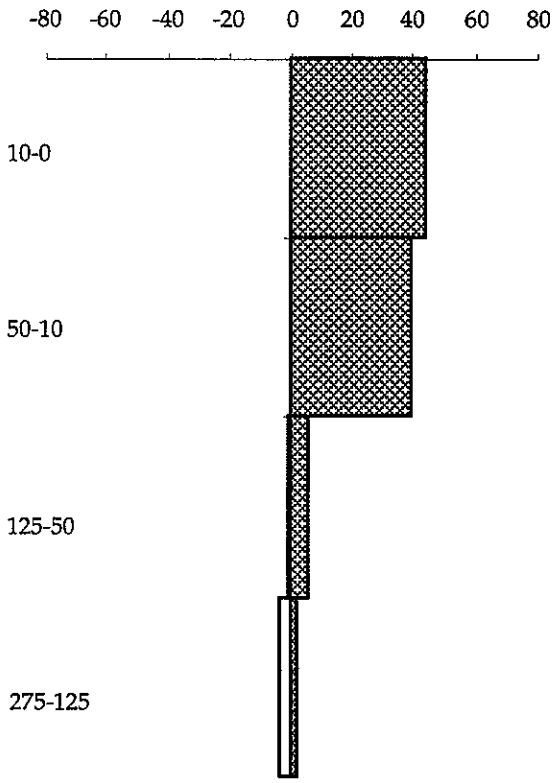
Southern Flank

Euphausiids/1000m ^{3}



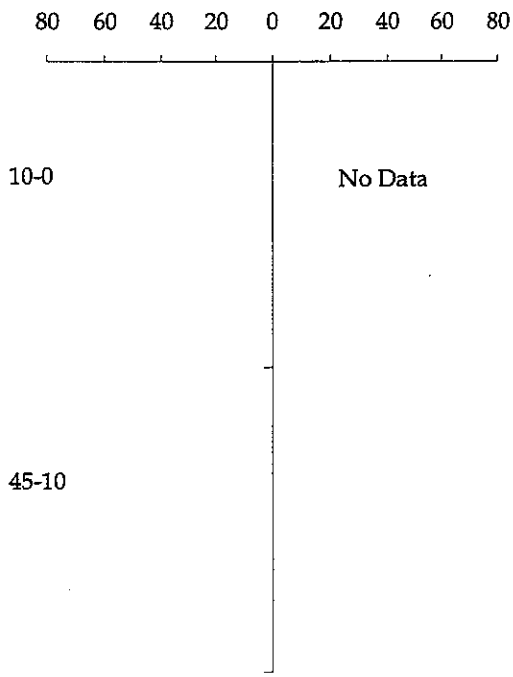
Slope Water

Euphausiids/1000m ^{3}



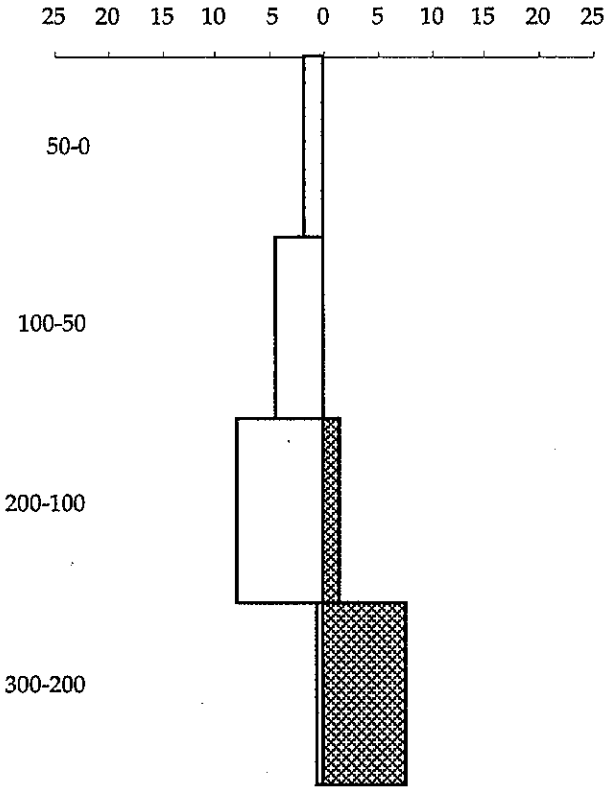
Bank Crest

Euphausiids/1000m^3



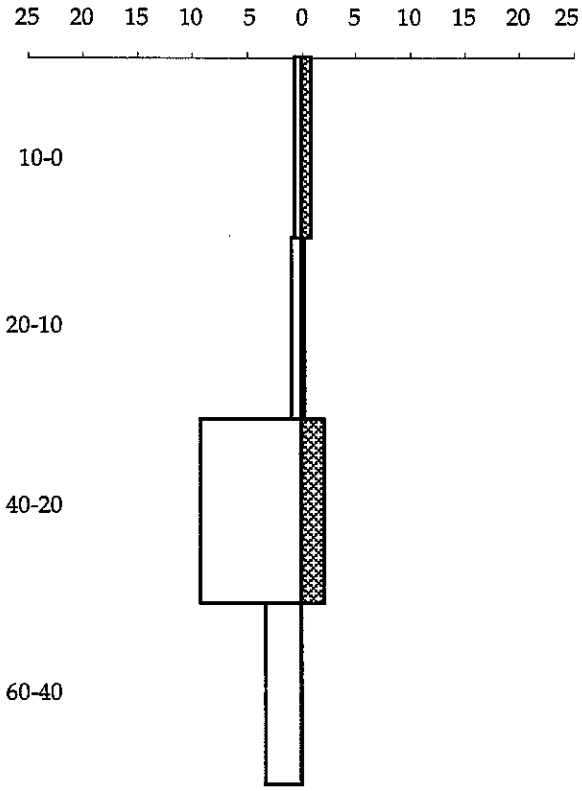
North East Channel

Themisto gaudichaudii /1000m^3



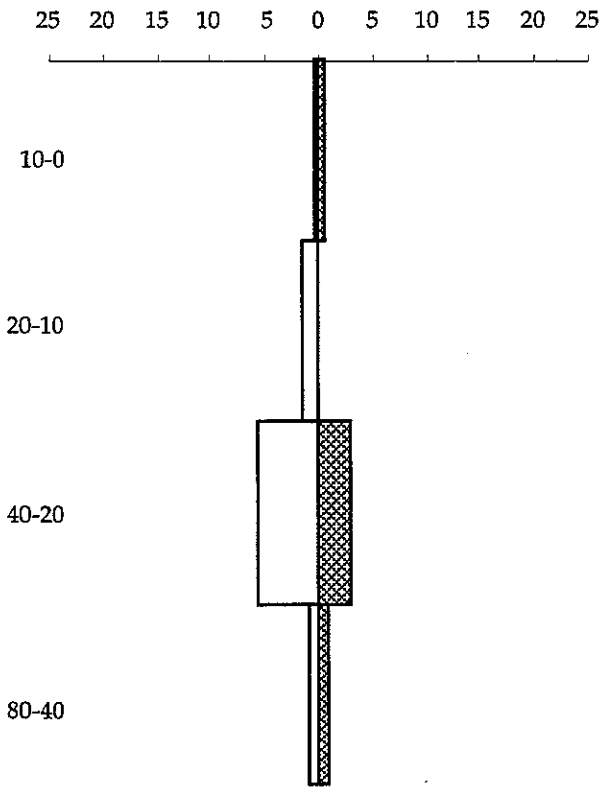
Bank Mixed

Themisto gaudichaudii /1000m^3



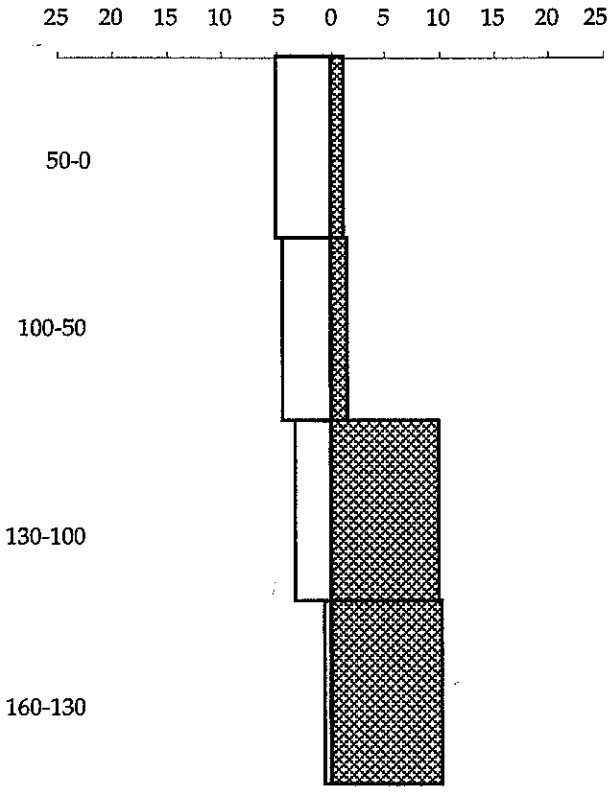
NE Peak/Cold Plume

Themisto gaudichaudii /1000m^3



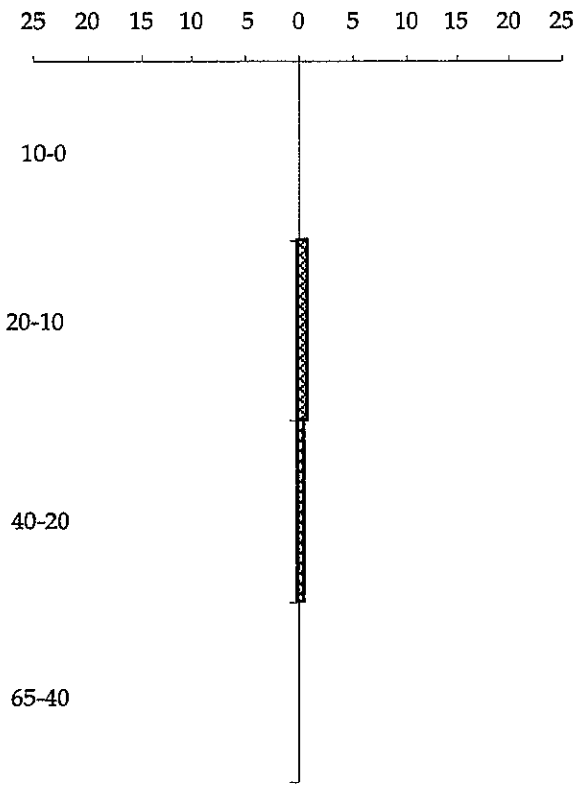
Great South Channel

Themisto gaudichaudii /1000m^3



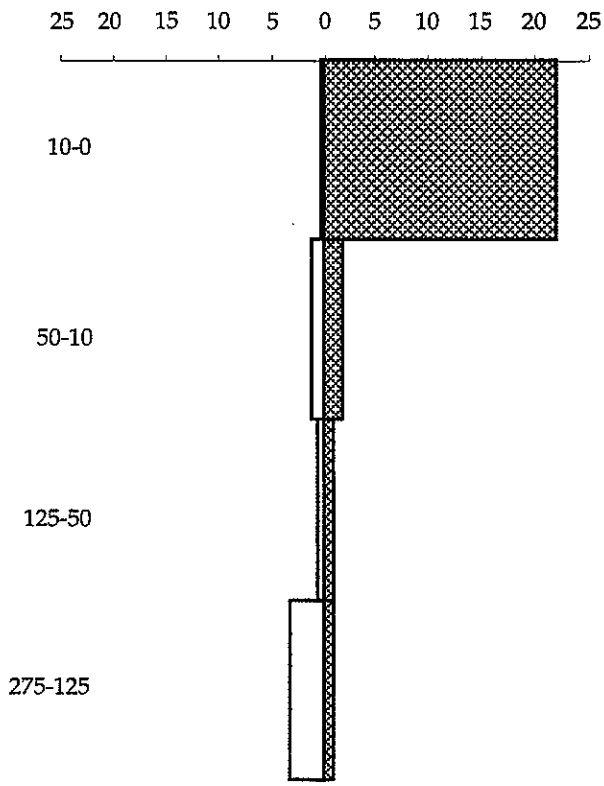
Southern Flank

Themisto gaudichaudii /1000m^3



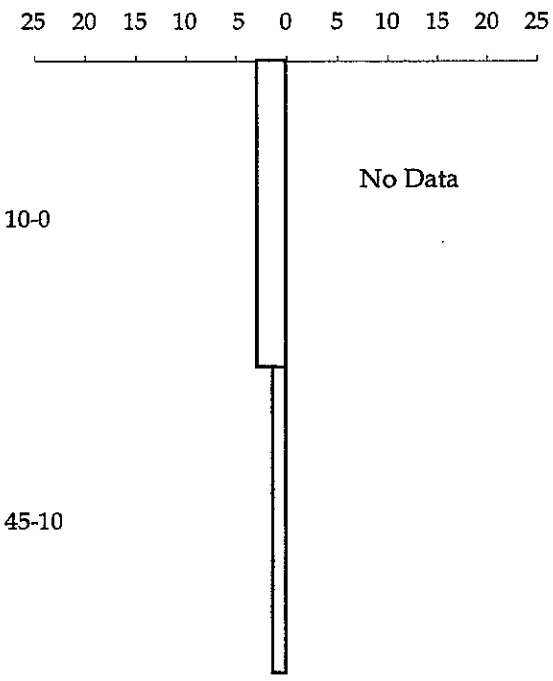
Slope Water

Themisto gaudichaudii /1000m^3



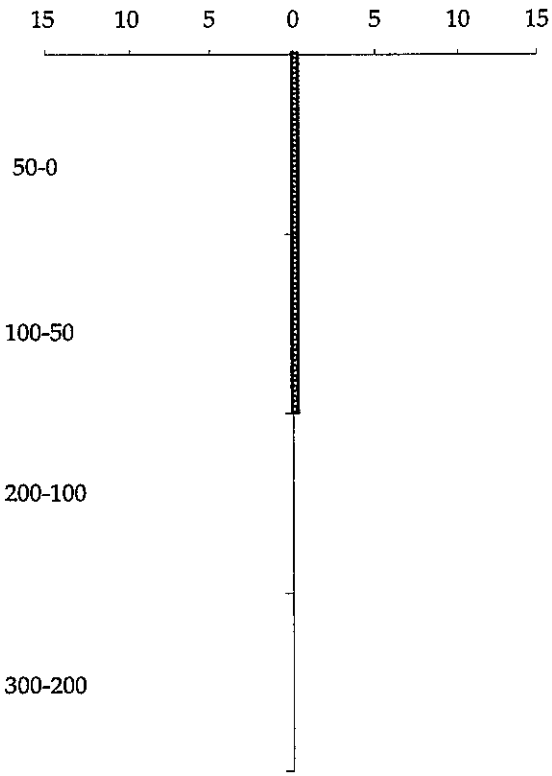
Bank Crest

Themisto gaudichaudii /1000m^3



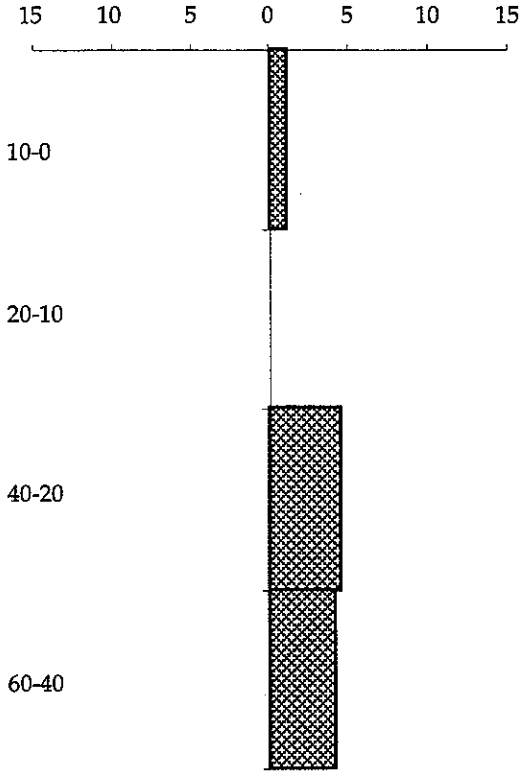
North East Channel

Ammodytes sp./1000m^3



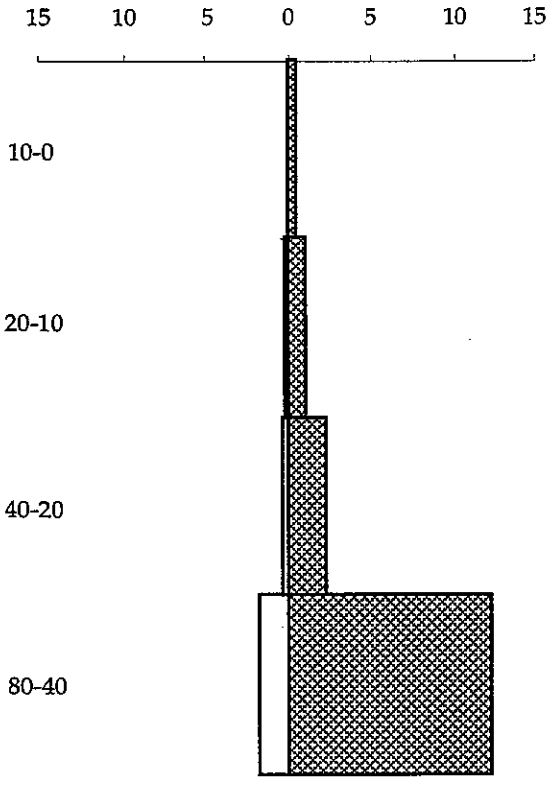
Bank Mixed

Ammodytes sp./1000m^3



NE Peak/Cold Plume

Ammodytes sp./1000m^3



Southern Flank

Ammodytes sp. /1000m^3